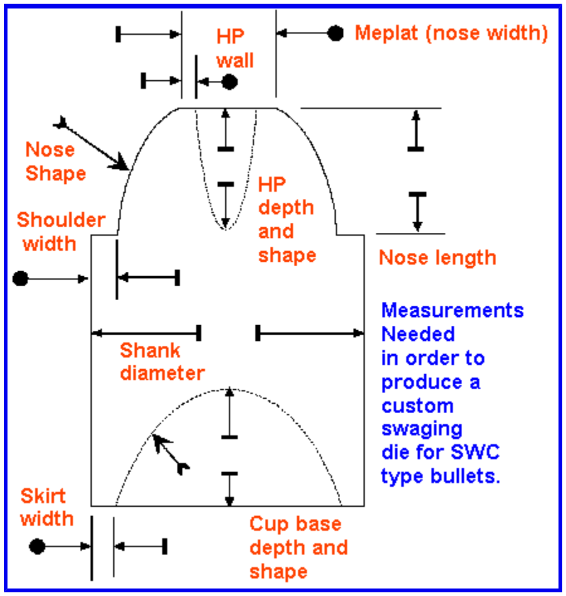
Problem Solving Tips



- Ask us!

STUCK BULLETS

Stuck bullets are caused by one of the following:

- Oversize or mismatched core seat die compared to point form die.
- Oversized or improperly annealed bullet jackets (especially tubing).
- Lack of correct lubricant (Corbin Swage Lube).
- Use of incorrect material (die set designed for one type and used with another).
- Excess core seating pressure (also can cause oversized bullets).
- Dirty or corroded jackets, or attempts to reform same-size bullets.
- Abrasive dust and grit on jackets or in the die.
- Damaged point forming die (scratches, gouges, rust, corrosion inside).
- Reverse taper or swelling in the die (excess pressure in previous use).

The core seating die must match the point forming die. They should be made and tested as a set, not purchased at separate times or from different die-makers. The core seater must be .0001 to .0005 smaller in diameter than the point former cavity. Using a core seater that is the same size or larger will produce a bullet that is destined to be hard to eject and will tend to stick, yet the trouble is not in the point forming die where sticking occurs. To test for proper size match, try swaging a pure lead slug in the core seater and another in the point former, and measure their relative sizes. Your micrometer does not have to be accurate, only repeatable. The core seated slug must be .0001 to 0005 smaller than the lead point formed slug. Otherwise, the core seater may need to be replaced with a smaller one, or the point former replaced with a larger one or slightly lapped out if possible.

It should be possible to insert the seated core at least part way into the point forming die by hand (until the ogive section is contacted). If this cannot be done, the seated core is too large. It will cause the bullet to stick when it is pointed up.

The right pressure to use in seating the core is just enough to make the jacket stay in the die (barely expands it to full die size) rather than come back out with the punch. But be careful that the punch is not sticking due to lead flow past it, or mismatch to the jacket or weight so the punch sticks into the jacket wall. Increasing pressure to make the bullet stay in the die under those circumstances won't work, and will either cause a broken die or an oversized seated core.

If you have tried the right lubricant, have followed directions about annealing copper tubing jackets (if used), are using the right components for which the dies were designed and tested (not just something close, but the right material including the proper lead hardness and jacket thickness, anneal and alloy), and think the problem may be with either the core seater or point former dies, be sure to send back all these items to help us solve the problem:

- Core seating die with both internal and external punches.
- Point forming die with both internal (ejection pin) and external punches.
- Samples of unseated cores and jackets, exactly as you would prepare them.
- Samples of seated cores and jacket so we can see how you are doing it.
- Samples of finished bullet if you can get any to come out (or one stuck in die).
- Any information that might shed light on what you could be doing differently.

Without this complete information and materials, we will only have part of the picture. It would be like taking the carbuerator off your car engine to your garage and asking why your car is running roughly. Odds are pretty good no one could figure it out just from that, even if something was wrong with it. With the dies, we would have to make any of the missing punches that you forgot to send before we could try the dies, slowing down the turn around time dramatically. For faster service, send all the parts so we can immediately put them to use testing and making bullets. With plenty of samples, a dozen or more, we can immediately get to work using exactly what you are using. If we use our components, the problem may not be there. Something different about your components may actually be contributing to the sticking. We would have no way to find it using our components.

TUBING JACKET PROBLEMS

Tubing jacket problems almost always stem from one of four errors you can solve:

- Use of improper material tolerances: wrong wall thickness, diameter, or length.
- Failure to anneal properly (or at all).
- Improper use of lubricant or wrong lubricant.
- Incorrect amount of pressure used.

Copper tubing jacket makers are designed specifically for one diameter and wall thickness of a given alloy of tubing. Tolerances are critical. If the set was designed for .032-wall tubing of 1/2-inch diameter and you purchase .035-wall tubing of 1/2-inch diameter plus .003 inches, you will have trouble with sticking, perhaps wrinkling. Even if the dimensions are the same, the material temper and grain structure can make a huge difference in reforming. Sometimes a softer material will require slighty different procedure than a harder one, even if the dimensions are the same.

If you cannot obtain the right tubing, Corbin can provide it. If you have a good supply of a given tubing, send enough samples so we can make the punches fit it instead of using our control tubing. Tubing jacket makers cannot be built at all without the right material to design and test them during manufacture. If you cannot send samples, and don't want to use our tubing, save yourself and us a lot of trouble and just don't order.

Generally all it takes to make a set work with a different tolerance of tubing is about six feet of the sample tubing (in good condition, not smashed flat from unprotected shipping). We need that much (not necessarily in one piece) to make and test three new punches (end rounding, drawing, and end flattening). If it is much different in wall thickness or diameter (which will eventually change final wall thickness after drawing) from the original design used with the dies, you may also need a new core swage die and a core seating punch, and possibly a different diameter of lead core wire or mould to fit into it (if the new size is much smaller than the original design specs).

Annealing is critical. Many people think they can skip it with no effect. Wrong. Everything about the tubing from that point on will be different from the properly annealed piece, and it will affect every operation from end flattening to core seating diameter to final point forming. Do not skip the annealing operation just because it takes a little extra time. It also takes a little extra time to put on your parachute before you jump out of the plane! However, if the specific instructions that come with your die set say not to anneal, then follow those instructions to the letter. A great deal of work goes into finding out exactly what is needed to make good jackets with a given sample of tubing. The procedure may be different from "standard" in some cases, and it is very important to read, understand, and follow the instructions provided with each set. The "general" instructions apply in most cases, but not all.

Often, people who have trouble with tubing jacket bullets at some point in the production (sticking, wrinkling, cracking, coming out over sized or under sized) have not annealed the tubing between the drawing and the end flattening steps or whenever the specific instructions with that set of dies says it should be done. Or, they have not heated the tubing enough to actually anneal it. The folded end of the tubing needs to reach a red glow but not brilliant red-orange (too much heat causes pitting and roughness). A propane hand torch is sufficient for this.

Sometimes, the only problem is using too much lubricant on the inside of the jacket or not enough. It is not the same thing as putting lubricant on the punch, since the jacket will tend to push the lube down and fail to get any deep into the interior where it does some good. A little swab with lube on it, applied to the inside of the tube, will put the lube where it works. But with some sets, there are specific instructions not to use lube inside or to use less than usual. Follow those instructions. Tubing jacket makers for different calibers, thicknesses, alloys and lengths can require slightly variations in lubricant and technique. What generally works may not in a specific case: do whatever the individual instructions say if they are different from general printed materials (we put hand written instruction with a die set if it needs something different to work right).

Sometimes we find that the problem of sticking or failure to come off the punch is due to the method of cutting the tubing. A "tubing cutter" used by plumbers is absolutely not right for bullet jackets! These cutters roll-cut the tubing and push it inward, creating open ends that are much smaller in inside diameter than the rest of the tube. Trying to push this over a precision punch made for the original diameter will, of course, create problems with sticking. Use a tubing cutter saw or other method that leaves a clean, burr-free open end that is the same diameter as the rest of the tube (not pushed inward or flared outward).

ACCURACY PROBLEMS

Accuracy problems can be the result of two general classes of error: (1) Defects in the bullet itself, and (2) Mismatch of the bullet to the rest of the shooting system. In the first instance, the bullet won't shoot under any circumstances because it is flawed, and in the second, the bullet may be just fine when used with a different powder or velocity, twist of rifling, kind of gun, or other external factor having nothing to do with the actual bullet quality itself.

Those problems that are defects in the bullet usually are due to one of these factors:

- Uneven or damaged base due to using incorrect or damaged punch.
- Undersize bullet due to using incorrect core weight or wrong seating punch.
- Eccentric bullet because of jacket material or internal parts seated off center.
- Insufficient shank length due to using too short a jacket or too long an ogive.

- Poor balance due to excessive nose length or too light a core for jacket length.

Those problems that are not defects in the bullet itself but a mismatch for a given application are:

- Use of too long an ogive for the twist rate of the barrel.
- Too heavy or too light a bullet for the twist and/or powder used.
- Center of gravity shifted too far forward or back for the twist and velocity.
- Diameter of the bullet too small for the given barrel (barrel too big).
- Muzzle pressure too high for the jacket base thickness or hollow base skirts.

If the base is damaged by using the wrong punch in the point forming die, a ring or ridge can be pushed into the base. This happens when an inexperienced bullet maker uses a core seating or core swage external punch when the larger point form external punch is required. Also, bullet swagers who are not particularly careful how they use the equipment may slam the external punches into the die face and bend or dent the edges of the punch. The punch can usually be repaired, but if used with the damage uncorrected, it will make fins or ridges at the base of the bullet, or make a sloped base.

In the quest for flatter shooting bullets that retain their velocity longer, shooters often go to extremes of ogive streamlining and add boattail bases to reduce drag. This is fine as long as the resulting bullet length and weight will stabilize in the twist rate of barrel from which it is to be fired. Sometimes, accuracy is sacrificed for ballistic coefficient without knowing it. The two are not the same. A very blunt bullet can be quite accurate. It just has a longer arc and drops faster, so you have to aim higher to hit the target.

There is a tendancy for some people to think in extremes. If a certain amount of something is good, a lot of it is better. Not necessarily true: in bullet design, everything is a balance. Making one factor, such as BC, extremely high may well cause problems with length, twist rate, weight, and balance. Good design is always a delicate mix of the correct amount of each factor for optimum results, not simply concentrating on one thing to the exclusion of all else. The highest possible BC may be too long a bullet to fit in the gun, or too heavy to fire, or require too fast a twist to be practical. Also, it may be a terrible game bullet even if it doesn't drop much on the way to the target. Usually the only factor that can be maximized without much regard to the others is accuracy. A precise bullet, perfectly matched in weight, length and balance, may or may not have the highest BC. But it hits where you aim, even if that means aiming a little higher.

INCOMPLETE LEAD NOSES

If the nose of a lead bullet or lead tipped bullet does not fill out completely, but seems to have a void or flat spot on it, check the following:

- Trapped lubricant in the nose shaping punch (wipe with a swab)
- Rough cut or angled lead core (core swage, to get a flat tip before shaping nose)
- Lead escaping from bleed holes before enough pressure builds (use core swage and core seat dies, instead of combining both operations in a single LSWC-1 die)
- Lead too hard to flow under normal pressure (use softer lead)
- Jacket too long for the length of lead core (use shorter jacket, longer core, shorter nose cavity)
- Not enough lead extending from jacket on lead tip bullet (use slightly more weight)

Long, deep lead noses formed in a punch (LSWC-1 type dies) tend to trap either air or lube in the tip of the punch, preventing the bullet from forming correctly at the tip. In a few cases, it is necessary to form such a bullet in two steps instead of one, using the CSW-1 core swage first to adjust the weight and square the ends, and then the closed CS-1 core seater with the nose punch in order to generate enough pressure to shape the tip.

In almost every case, you can make a better looking lead bullet nose in pistol or all-lead bullets by reversing the bullet or by using a core swage die first. By swaging an all-lead bullet and then turning it over to swage again, you flatten the base and then press this nicely squared base into the nose punch, reforming it evenly as the nose. This tends to elminate off-center voids and folds that can occur when you form a raw piece of lead with a rough end in a deep punch cavity.

Lead tip jacketed bullets require a wider jacket opening than is commonly realized, with enough lead extruded out the tip to form a complete filler for the lead tip punch cavity. If you have a very tiny amount of extruded lead, it may not fill the entire punch cavity before the punch edge contacts the jacket. This either puts a ring in the jacket, or fails to form a good tip on the bullet.

A special point forming die with synchronized ejection pin, precision fitted and honed to fit the ejection pin hole, allows the ejection pin to be set for precisely the right length to close the end of the point form die with either a radius or a flat end. The flat end works best in most cases, because a radius cavity acts like a cookie cutter against the lead. It can impress a ring into the tip before the bullet is ejected. The flat ended ejection punch typically forms the tip smoothly and evenly, since the pressure can be much higher inside the die than it can with a standard point forming die. Standard dies have a relatively loose fitted ejection pin wire in the ejection hole, and the ejection pin punch serves no other purpose than to push the bullet out. Since it is retracted during the actual forming of the bullet, you can only push the bullet with enough pressure to fill the cavity and just begin to extrude the tip into the ejection pin hole. With the custom fitted punch, you can press the bullet up against the punch, and transfer the surface finish to the bullet tip.

In almost all cases, by examining the operation and determining if there is (1) enough exposed lead to fill the punch cavity and (2) enough pressure to flow the lead into a tiny cavity tip, you can solve the problem. The solution isn't always the one a person might want (using two dies instead of one, for instance) but with certain shapes, alloys or calibers it may be the only practical one besides changing the weight, nose shape, or alloy. If you are already using pure soft lead, a change of alloy seldom helps. Sometimes being diligent about not getting too much lubricant on the tip or in the nose punch will reduce the degree of the problem enough so no other solution is required.

RIMFIRE JACKET FOLDS, WRINKLES

Bullet jackets made from fired .22 cases tend to be work hardened and must be annealed before forming the ogive. A nose fold, from a flap of jacket material buckling under at the tip, can be solved in three ways:

- Heat the jackets to dim red in a dark room, then allow them to cool.
- Use a larger tip opening or a large lead tip on the bullet.
- Support the ogive at the tip with lead instead of making an open tip design.

If you heat a rimfire jacket too much, it may become so soft that when you form the ogive, the pressure of bringing the nose down into the curve of the die will buckle the shank portion of the bullet. This makes dents or folds around the circumference. When the jacket is too hard, it folds at the tip instead of buckling in the shank area. Fortunately, there is a broad range of anneal temperatures and times that work, on either extreme of too soft or too hard. A regular propane torch is sufficient for annealing. Most gas or electric home cooking ovens with self cleaning feature get hot enough to anneal or at least stress relieve the jackets so they won't fold.

ROUGH LEAD SURFACES

When swaging lead bullets, or when forming points on lead tip, flat point jacketed bullets, the exposed surface of the lead can be roughly formed under some circumstances. The tips of bullets with a large flat point may be rough simply because they were not pressed against any smooth steel surface to acquire a smooth finish: the very tip of a large flat point bullet may be formed simply by pushing the bullet less than all the way into the point forming die. Since the end of the bullet is being formed from within, by moving the lead forward, rather than from pressing against a punch or the end of the die, the end may be uneven and rough.

There are four ways to fix the rough flat end of a lead tip bullet:

- Use a lead tip forming die to follow the point former, finishing the flat lead tip.
- Turn the bullet over and gently push it backward into the PF die, cleaning up the tip.
- Push the bullet all the way to the end of the point form die.
- Use a special point forming die with a fitted ejection punch (larger than standard).

An additional trick is to use a large hollow point punch, which eliminates most of the lead tip. The remaining lead around the cavity is easy to square off by gently tapping it with the base punch as the bullet is pushed slightly backward into the PF die, or by using the HP punch in this manner instead of the flat base punch.

When the problem is roughness on the sides of a lead bullet, the problem is usually caused by (1) insufficient swaging pressure, or (2) too undersized a diameter of lead wire or core for the die cavity. Folding and wrinkling can take place at the surface of the lead when a core too small for the die is inserted and compressed. The folds and wrinkles don't trap air in any significant quantity, but the tiny amount they do trap can form small pits on the surface. Sometimes you can reduce or eliminate the lubricant with a lead bullet, which can help produce a shiny surface at the expense of possible leading of the die (which then starts to cause further surface pitting of the bullet). A fine balance between too much and too little lubricant may be found to produce a nice surface finish.

In most cases, however, the finish will be quite good. Even in those cases where pitting or roughness appear on a lead bullet, the effect on accuracy is nil. It is primarily a cosmetic effect. If you are not bothered by it, don't worry about it. On the other hand, if you intend to market the bullets, a chrome-like finish is helpful in supporting a good price. So, you may wish to experiment with amount of lube, degree of metal purity (usually pure lead is best for swaging but a tiny amount of tin or antimony such as 1/2 percent can aid in a nice finish), amount of pressure (but don't exceed breaking point of the die), and size of core. In some cases, if you have an investment in a certain size of mould and die and have produced a large quantity of bullets that are not as shiny as you like, you can get a simple draw die to push the bullets through, slightly reducing their diameter and producing a burnished surface. Then you can swage them again to bring the diameter back, and retain or even improve the finish since lube and air cannot be trapped at the surface if it is smooth to begin with.

UNDER OR OVER-SIZED BULLETS

Under-sized bullets can be caused by these factors:

- Core seat die too small for the point former diameter.
- Improper or no jacket anneal when required by the operation.
- Use of incorrect material (jacket or lead alloy) for the die set.
- Insufficient core seating pressure.
- Core seating punch too large or small for jacket thickness and core length.
- Insufficient point forming pressure.
- Making too short (light) a bullet in a long ogive die.

Test your die set by forming two pure, soft lead cores. Save one and reshape the other in your point forming die. Compare the two cores for diameter. The core seating die should produce a cylinder that is from .0001 to .0005 inches smaller than the lead slug from the point form die. If it is .001 or more inches smaller, you may have too small a core seater, or too large a point former. In any case, the match between them is not correct.

If this is not the problem, then make sure you are annealing the jackets if required to do so, that the jackets are the correct material, length, and wall thickness for the die set, and that the lead core is the material for which the set was designed and tested. If any of these are wrong, the diameter of the final bullet may be wrong by a small amount. Some calibers, shapes, and styles are quite forgiving and some combinations are not: there is no hard rule about how far from the design standards you can go before running into problems with diameter. But if you do, go back to the design standard and try again. Make no assumptions about materials until they are tested. Send samples of all materials, including formed samples at each step of the production, back to Corbin for study along with your dies and punches whenever you have a chronic problem that requires assistance.

One problem that is easily solved is caused by using a core seating punch that strikes the jacket interior before it can compress the lead core. Usually the jacket is strong enough so that it stops the progress of the punch, and prevents enough pressure from being applied to the core to expand the rest of the jacket. This can result in very markedly undersized bullets. It can also make shorter bullets than the jacket would normally produce (due to compression and thickening of the lower shank portion of the jacket).

When the punch is too large for the particular jacket diameter, wall thickness or core length, it strikes the jacket wall (which is normally tapered, except in tubing jackets and rimfire case jackets) and prevents enough pressure from being applied to the lead core. When the punch is too small, it slips down easily into the jacket and presses the core, but the pressure can blow lead past the punch, out the jacket mouth. This also limits the pressure (if you apply more, all that happens is more lead spurts out). Using either too large or too small a core seating punch can have the effect of creating an undersized jacket, because both limit the pressure you can apply to the core.

An undersized bullet will always result in a properly sized point forming die if you push the a short bullet too far into the die. The ogive curve of a bullet nose is always smaller in diameter as you go toward the tip (by definition and logic, if not the need to get the bullet back out of the die!). Obviously, if the nose is half an inch long, that half inch of die is undersized compared to the desired shank diameter. Pushing a half-inch-long bullet into the die is possible if you don't push it fully into the ogive area. But if you do, the punch will begin to enter the ogive and may be damaged. Just before that happens, the entire length of bullet is turned into the nose shape! Where is the shank? Gone! So what is the diameter? Less than the shank size, that's for sure...and should be no surprise.

This happens in a more subtle way when you have a long spitzer ogive, and have decided to try to use a bullet weight that is more appropriate to a conventional or short ogive bullet. As you push the bullet further into the die, to try and make a small tip, the material runs out of the shank area and goes almost entirely into the ogive. But because long ogive shapes create a very shallow angle or taper at the shank, the punch may actually slide just a little past the full bore size without apparent damage, and the bullet will be sized below bore diameter all the way to the base. You may think that the die is undersized, but doing the math will show that the length of the ogive is the same, or longer, than the length of the bullet!

The solution is

1. make a heavier bullet, or
2. make the same weight longer by using lower density material (plastic ball, copper powder, etc. instead of lead), or
3. don't push the bullet so far into the ogive and settle for a larger tip, or
4. get a die with a shorter ogive curve for that weight and length of bullet, or
5. use a hollow point or hollow base design to make the bullet longer for the same weight.

Oversized bullets generally result from (1) using the wrong materials or not annealing the jacket when it is called for in the instructions, or (2) an over-sized point forming die. The same die that makes a perfect .510 bullet using a copper jacket that has been properly annealed can produce a .512 bullet used with brass or unannealed copper. Sometimes just the thickness of the jacket will produce different diameter bullets by as much as .001 inches. When you need a specific diameter and cannot accept .001 over or under, be sure to use the same materials and techniques for which the set was designed. If you must use different materials, order the set to produce the largest acceptable diameter and then order some drawing dies to reduce the bullets slightly when necessary.

There is no hard rule about what material changes will cause exactly how much increase or decrease in diameter. This is part of the necessary experimentation and development that goes into creating a new set of dies for you. If you send the material you intend to use, or have the dies made using our material and then continue to use that in the future, the diameter will be constant as designed. When you change materials in any way, such as hardness, thickness, alloy, even length (for different weights), there can be an effect on diameter but there is not necessarily going to be. Just be aware of the possibility, experiment and measure, and then a proper solution can be found for almost any material changes once we know precisely what is happening. Sometimes the solution is a different set of dies, or at least different core seat and point form dies (the core swage and lead tip dies may remain the same in some cases). Sometimes it is a slightly different technique, avoiding certain materials, or using different pressure. And finally, it may be just getting a reducing die to finish off the bullets.

BROKEN DIE

Almost every case of a broken die is caused by applying too much pressure. Dies do not break for any other reason 99.999% of the time. Very rarely, perhaps .001% of the time, a die may have a heat treatment defect or a flaw in the material. This is so rare as to be almost non existent but it is possible.

However, it may not be apparent that this is the cause, because dies can be subjected to excess pressure many times, weakening, fracturing, and causing crystaline structural damage, before they finally let go even under normal pressure. It is much as if you took a piece of metal and bent it over and over again until it was almost ready to break, and then set it aside for a month. Someone finally picks it up, barely touching it, and it breaks off. The force was certainly reasonable for the normally treated metal thickness, but because of the invisible but severe stress applied before, the metal snaps easily now.

It is relatively easy to determine how a die was broken. A die that snaps from excess pressure normally will break cleanly, sometimes into two or three almost saw-cut appearing parts. The surface is usually smoothly crystaline in appearance. There may be irregular broken surface areas but often the surface is frosty and flat. At the time that the die breaks, the pressure being applied may or may not be excessive. The history of the die prior to that moment may be the key. If the die was stressed beyond its elastic limit but not far enough beyond to actually cause a fracture, it may let go with below normal pressure on the very next attempt to make a bullet. Or it may slowly continue to crystalize and develop deep inner fissures before anything is visible, giving no apparent warning.

By doing Rockwell hardness testing on the exposed broken surfaces, we can quickly tell if the die was damaged from excess pressure or if it had incorrect temper or a seam in the bar stock. This latter is so rare that a die-maker may spend a lifetime without seeing one example. Temper used to be more of a problem before computer controlled electronic heat treatment furnaces, but now it is extremely rare for a die to be "brittle" because of lack of tempering. This is not to say the possibility doesn't exist, and any broken die can be sent in for testing without charge. If it is found that the die is too brittle, it will be replaced under warranty.

The following will void the warranty on dies if they are broken as a result:

- Using anything but Bhn5 (pure soft) lead in type -R dies or type -M dies.
- Using materials harder than Bhn10 in type -S dies.
- Using materials harder than Bhn15 in type -H dies that were not designed specifically for it.
- Failure to anneal jacket materials when required by instructions.
- Using any type -R or -M die in a power press.
- Using any type -M, -S, or -H die in any press not designed by Corbin.
- Use of home-built dies, punches or presses with Corbin die sets.
- Using applying pressure in excess of the design limits of the dies and punches.
- Heating, drilling, grinding, or machining any Corbin dies or punches.
- Any modification to Corbin die sets, punches, presses, or tools.
- Use of the dies in any manner for which they were not designed.

Most people do not break dies. But a very few people constantly break them. Since the primary cause of breakage is the application of more pressure than the dies were designed to handle, anything which produces this much pressure is misuse, not proper operation. For the few people who may disregard instructions and assume that the warnings do not apply to them, it is necessary to spell out the limits of warranty. But in general, we see very few broken dies and often take care of the few we do see as a warranty even when it truely may not be a defect in the die, if there is any reasonable possibility that the die might have been "brittle". With Rockwell testing, we can quickly find out exactly how hard the die is at any depth, locate seams, and generally pinpoint the problem.

One way to reduce the chance of breaking a die is to avoid jerking the handle, using sudden impact instead of gentle, smooth application of pressure. When you impact the material instead of applying pressure in a moderate approach, a shock wave is created as the lead inertia keeps it from flowing for a moment. The localized pressure in the die can be enough to burst it, even though it would have made the same bullet "forever" if the swaging action was applied in a little slower manner, giving the lead time to start moving.

People sometimes say "it just broke and I wasn't applying any unusual pressure!" but at some point, the bursting strength of the die had to be exceeded, or it wouldn't break. Generally, what feels like gentle force is really quite large because of the powerful leverage system of the swaging press. The "feel" of force is less and less as you approach the top of the stroke. If your punch holder was adjusted a little lower last time, you would "feel" more force with the same pressure. If the punch holder is then used at a higher position, the ram might go slightly further up before encountering resistance. At that point, the force would appear to be very light but the increased leverage might be 25, 30, or even 50% more than it was last time with the lower setting. The leverage increases at a log or square function rate, so that a tiny movement near the top of the press can make a large increase in pressure, whereas the same adjustment a little lower in the stroke might make considerably less difference.

The result is that someone who is not familiar with this press technology and its implications would think they applied the same or even less force when the die was broken, compared to the other times when they had no problem swaging the same bullet. No doubt the apparent force was the same or less, but the actual amplified force at the higher stroke position is significant. It accounts for the frustration of honest people who feel they did nothing wrong, because the tacile feedback did not indicate any additional force. To avoid this, always raise the ram to the top, first, and then adjust the punch holder downward to contact the material in the die. Then slightly lower the ram and make small incremental adjustments in the position of the punch holder until the bullet forms on the next upward stroke. Save a bullet or core as a gauge to make the same setting next time.

BROKEN PUNCH EDGE

The edge of a punch that has a cavity in it can be broken in these circumstances:

- Swaging too long a bullet, so the punch is not a full caliber inside the die.
- Striking the edge of the die through careless operation.
- Using the punch against improper materials or shapes.
- Using the punch in the wrong diameter or type of die.

If a bullet is so long that a nose punch, or a rebated boattail base punch, will not fit at least a full caliber length inside the die before any pressure is applied, the thin wall of the punch may not be supported on the outside. Since swaging pressures of 20,000 to 50,000 psi and more are easily generated, the force may crack the punch. This might not be apparent right away. You may notice it later, when a shorter bullet is in fact being swaged, and think that the punch broke at that time when it really did not. Sometimes the break is nearly invisible for a time, until repeated stress causes it to continue to enlarge and eventually a piece falls out of the punch. This often explains the "I didn't do anything" syndrone, because the person who broke it really didn't notice anything wrong until later, when he truely was not doing anything wrong. But punches don't break themselves!

Striking the die face happens when the punch isn't aligned with the die. This usually is caused by operating things too fast, slamming the handle up and down and not noticing that the die has come partly unscrewed or the punch holder isn't holding the punch firmly any more. Slow down, check things out, and make sure that the punch slips into the die cavity without hitting the edge of the die on the way.

Using a cavity type punch against the wrong surface can put a lot of stress on the edges of the punch. The punch is designed to be supported against tremendous pressures by the die wall on the outside, and by a very close fit of the material being swaged prior to any pressure being applied. This is less true with punches that form lead, because lead noses or bases don't offer much resistance to the steel if the lead is soft. Hard lead or jacket material that is not preformed to almost the right shape (usually in a die cavity, as with rebated boattail bullets) can create breaking forces on the edge of the thin punch walls.

Using a punch designed to form a lead nose as a tool to reshape an aluminum or hard lead slug can destroy the punch in short order. So can use of the punch in a die that is too large (or too small). If the die is too small, the punch will be swaged down and enormous pressures developed in the walls during the process, which will usually crack the hardened and tempered punch (the punch is made softer than the die so it will usually break first, being less expensive to replace). Try punches by hand before forcing them in with pressure. If it is obvous that the punch is larger than the hole in the die, why put in in there? Yet a few people do.

Using a punch in too large a die might not seem dangerous to the punch, but it is. If the punch has a cavity in the tip, the walls of the cavity are not supported by the die walls. A punch with a cavity expands slightly under pressure, until the punch contacts and is supported by the die. This is like a piston ring in a car engine. When you put the punch into a die large than the designed size, there is no support until the punch expands too much and cracks. Punches can expand only a tiny amount, in the range of a few ten thousandths of an inch. They slip up and down in the die because they spring back when the pressure is released. But metals have an elastic limit: push them beyond that, and they may not spring back far enough, or at all. In fact, they may take up the room by cracking.

Examples: Do not use your .355 (9mm) nose forming punch in a .357 die. It may work -- for a while. If a point forming die makes a nice 180 grain 308 bullet with a boattail, as designed, and you try to make a 190 grain bullet, be sure that you check very carefully whether the boattail punch is at least .308 inches up inside the die before any resistance is met. If not, quit pressing and make a shorter bullet or get a different die for the longer bullet if needed. As long as you check for good support of the punch tip to the bottom of the cavity before applying any force, you shouldn't have a problem with cracking the punches by making bullets too long for the die set. Normally one caliber length is sufficient support to keep the punch from breaking.

PRESS RUNS OUT OF STROKE

If the punch just doesn't reach far enough to do the job in the CSP-1 or CSP-2 press, check the setting of the ram link pin! Some jobs, such as drawing and reloading-type operations, use the long stroke setting and all swaging operations use the short stroke setting (doubles the power, also). The position of the ram at the top and bottom of the stroke will be considerably different in these two stroke settings. To change stroke settings, remove the link retainer pin and push the ram link pin sideways to free it from the ram, while holding the ram with the stop pin or ejection bar so it can't fall out of the press. Jog the handle slightly to find the best place where pressure is relieved on the pin and it will move easily.

Reposition the ram and handle so you can put the ram link pin in the second set of toggle holes, push the pin into position and be SURE to remove the stop pin or ejection bar from the press! If you do not remove the stop pin now, in the long stroke position, you can shear it off!

If the problem is simply that you are making light a bullet, and the external punch runs out of length before it contacts the material in the die, you may need a different internal punch (with a longer head section) to move the material closer to the die mouth. If the problem is that your bullet is too heavy and sticks out the die mouth, or you cannot get the material in and out of the die without moving the punch holder, you may need a different internal punch or perhaps you have exceeded the maximum possible length for the press. About 1.2 inches is the longest bullet for the Silver Press, about 1.3 for the Series II press, and about 1.5 for the CSP-2 MegaMite press. The hydraulic power presses using -H dies have adjustable top and bottom of stroke positions, so you can make extremely long bullets if the dies and punches accept them.

Each die set is designed for a certain range of lengths of bullet, and may or may not be able to make other lengths outside this range, depending if the limit is caused by the maximum cavity depth, minimum head length on the punch, or another factor. Sometimes you can exceed the design limits a bit by removing the retainer bushing from the punch holder, and guiding the external punch by hand, then removing it to load in another bullet, replace it and swage, remove and eject and load, and so forth. Those operations that do not pull on the punch work well, such as the point forming or core swaging operations. Some core seating jobs tend to pull on the external punch so you need to have it secure on the down stroke.

BROKEN STOP PIN

If the stop pin is broken in the CSP-1 press, it generally is caused by one of these things:

- Swaging hard material or oversized components.
- Allowing foreign material to fall into the ram.
- Not securing the stop pin in the slot of a point form die's punch head.
- Using an internal punch with an out of tolerance head length.
- Applying force rapidly with the handle horizontal (max.force on the pin).
- Attempting to swage bullets with the press in the reloading stroke.

Hard material, especially in the core swage or LSWC-1 type dies, is difficult to shear off at the extrusion holes on the back stroke, and may create excess force against the stop pin. Foreign material can cause the ram to force against the stop pin at the bottom of the stroke by raising the effective bottom of the hole inside the ram. The end of the point forming (or RBT) die ejection punch may strike and bend the stop pin if it isn't secured by placing the stop pin in the slot, located in the side of the ejection punch head. A brittle stop pin can occur in situations where there is a failure to properly supervise the loading of a batch of pins in the heat treatment furnace, causing a hot spot that does not allow correct drawing temperature for some of the pins in the batch. This is not common but if it should happen, the pin will be replaced without charge. Simply return the broken pin for testing. Normal replacement pins are $5.

It is always best of apply force smoothly, rather than jerking the handle. The impact may break the stop pin, where a more gentle application of the same force would not. Swaging operations should always be done at the top of the stroke with the handle nearly vertical, not with the handle pointed out at 90 degrees from the press (horizontal). The minimum leverage occurs at this position, increasing stress on the system. At this point, the components should have already been released from the die and simply be moving out with low force. If it is otherwise, the operation probably is not correctly set up.

The stop pin must be removed with the CSP-1 press is used in the reloading (4-inch stroke) mode. Otherwise the ram will be stopped by the stop pin part way through the stroke, and all the press leverage will be applied to the stop pin. It is not designed for this, but only to support the internal punch and cause ejection on the down stroke. The pin may bend or snap as a result. If the stroke appears to be blocked, so you cannot move the handle through a full 180-degree arc (from straight up to straight down) then check the position of the ram-toggle pin. If it is in the long stroke or reloading mode, the stop pin must be pulled staight out and not used.

HYDRO-PRESS TROUBLESHOOTING

The Corbin Hydro-Press is an extremely reliable piece of equipment, with examples known to be running well after 1.5 million or more bullets have been made over a 12 year period. Still, certain problems can occur. The most common would be dirt or contamination blocking the free movement of the solenoid directional valve (located on top of the hydraulic reservoir inside the press cabinet).

This happens when the filler cap is removed, and fluid is added to the tank, without making sure that no grit or dirt is present in the filler funnel or other devices that may be used to direct the fluid into the tank.

Normally the tank does not need to be filled again once it leaves the factory. But if you change the oil filter (which should be done perhaps once every 1-2 years of heavy operation or 5 years of normal hobby use) there is a chance of getting some grit into the clean intake line at that time. Hydraulic systems must be treated almost like hospital equipment and kept very clean when you are working on exposed lines and components. Once the parts have been put together, the system is extremely resistant to outside dirt. It is vunerable only when taken apart or when new fluid is being put into the tank.

The symptom of a contaminated solenoid valve includes failure to move, jerky sporatic movement of the ram, failure to go in one direction but not the other, loud unusual vibrating or squeeking noise with slow or erratic movement, and in some cases failure to stop moving until a physical limit is reached (valve sticking open in up or down flow position). The cure is always to replace -- not attempt to fix -- the solenoid valve. It is highly unlikely that the valve can be repaired in the field. It is an extremely precise device requiring expert service and highly specialized tools. Replacement is not difficult: four wires and four bolts let it come off easily. No plumbing needs to be removed.

Before attempting to take any part off the press, be sure to call Corbin and get specific instructions concerning cleanliness, protection of the valve seats and the o-rings under it, and details for testing the valve while it is on the press. It is highly recommended that any trouble shooting be done by a qualified industrial hydraulic service person, not by farm or road equipment hydraulic service personnel.

Electrical logic systems on the CHP-1 press can be tested by a qualified electrician while Corbin is on the phone to give instructions. There are six logic relays and a TDL relay, and the six logic relays all interchange to find out if one of them could be defective. A specific test process of the relays, which plug into sockets, can quickly determine if one is bad (sticking, open coil, or open contacts).

Problems which are easily cured in the field include turning the pressure control so far to one end that the screw adjustment mechanism runs off its range (a procedure for disassembly and repair is available on request), setting the pressure reverse so low that the mere movement of the ram triggers a reverse signal (and the press simply vibrates loudly as it tries to go up and immediately is told to go down by the sensor), removing the proximity detectors and replacing them in the wrong positions, adjusting the proximity detectors so that they always see what they think is the ram in front of them even if it is a guard or some other metal object, setting the pressure too low to trip the pressure reverse sensor, and screwing the ram speed control so far that the ram does not appear to have any visible movement.

To solve these and other problems, a trouble-shooting guide complete with wiring diagram and hydraulic schematic is available on request. Be sure to call and perhaps we can simply talk you through a series of simple tests to find out the likely cause of your problem. Never start taking the machine apart without at least trying to get help first, as most problems are not as serious as they seem and often stem from adjustments rather than major components.