

## Case Reforming – Cartridge Conversions

By Molly



*I asked Molly to put together some details on case reforming as he has done quite a bit of it over the years and for many today who are used to the abundance of good inexpensive brass we have in lots of odd old chamberings, they may not have ever had to do these things. Lest this become a lost art, I thought it best to document the tricks and post it to castpics. Many thanks to Molly the large amount of effort that went into putting this together.*

Wiljen

First of all, I need to advise you that really substantial case forming operations are for the advanced reloader. Anyone interested in more advanced procedures is well advised to get and read (and study!) copies of George Nonte's classic Home Guide to Cartridge Conversions and / or John J. Donnelly "The Handloader's Manual Of Cartridge Conversions" – preferably both.

Also, by reference, I'd recommend you take a look at <http://www.castpics.net/subsite/Conversions/default.html> for a wealth of case measurements that I accumulated over many years when we didn't have the wealth of cases available today. They aren't specifications, but are (mostly) measurements from actual specimens.

Case forming can be an absorbing hobby. The way brass can be squeezed or expanded or thickened or reamed or cut or trimmed is all but infinite. If you understand the peculiarities that brass can exhibit as it is worked and formed, you can make cases for almost any gun. The following should give you some basic instruction and open the door into more extensive operations that you may want to try some day.

I've actually made workable cases for the 577/450 from 30-06, and later I'll go into the techniques – but being reasonably cognizant of liability laws details on the exact techniques I used will have to remain confidential. But when someone offers you a rusty rifle with a bore that you can stick your thumb into, and a chamber that looks big enough to attract hibernating bears, you aren't going to find ammo at your local sporting goods emporium. You're pretty much on your own, but the following should get you started.

That said, case forming can be defined for the purpose of this article as the practice of altering an existing case to function safely in a gun. It frequently happens that the gun is one it was not initially intended for, but not necessarily. The common reloading practice of resizing brass cases for smooth, easy chambering is actually a case forming operation. A great deal of case forming is just more extreme sizing. You can even use the same sizing lubricants as long as you don't get in a hurry and try to do a lot of forming in a single pass. Other commonly available lubricants like STP oil additive and lanolin can do yeoman duty too. But you must never try any sizing operations without generous lube, or you'll end up sending your dies back to the maker for them to remove a stuck case. Few things are more frustrating.

I'll touch on some of the exceptions below, but case forming generally isn't black magic. It's just common sense applications of what reloaders do every day, but carried to extremes that most handloaders don't get to.

To tell the truth, the modern handloader has such a wealth of newly manufactured cases available that much of the motivation behind a lot of the early work in case forming simply isn't justified any more. But the techniques will never die as long as there are old guns for which ammo hasn't been readily available for a few generations or more.

More extreme operations such as turning cases on a lathe from solid stock are for the very advanced reloader, and can contain significant elements of hazard for the inexperienced. Most of the operations discussed below will have little or no element of risk associated with them, if these instructions are followed carefully. Some case forming operations are simplicity itself, and can be done with the reloading equipment you probably already have. Some case forming is best done with a set of specialty dies from someone like RCBS. They actually have a service that will make you a set of custom case forming dies if you just tell them what case you want to make, and what case you want to make it from.

Outside of the ordinary resizing during reloading a round, the most elementary case forming operation is probably altering the length of the case by trimming. Resizing operations will result in a slight length increase each and every time you do it. Over an extended series of reloads, this increase can accumulate until the mouth of the case jams into the throat, which prevents it from opening properly when fired. This will increase your pressure, perhaps dangerously so. It is simple and easy to prevent. All you have to do is to trim the length of the neck to bring it within factory specifications.

The first step in this process is to actually check the overall length of your case. There used to be devices called case length gauges, which were a series of simple gaps cut into the side of a metal plate. These gaps corresponded to the correct length for a series of popular cartridge cases, and all you had to do was see if the case would fit within the gap labeled for your case. This was quite workable, but required a lot of handling. I long ago went to an inexpensive dial caliper to actually measure the lengths. When a selection of cases from a given batch began to approach maximum lengths, the entire batch was put through a trimming operation to bring them back to a safer length.

There are numerous ways to perform the actual trimming operation. Some require no knowledge of the proper length, as they use tools that will cut to a predetermined length. One of them is the inexpensive and elegantly simple Lee trimmer, which has a cutter mounted on what looks like a decapping rod. In use, you simply grasp the case with a small collet that Lee provides for the purpose, and insert the trimmer through the neck into flash hole in the base of the case. Rotating the trimmer causes it to cut the mouth of the neck. When the trimmer no longer cuts, you are done. De-burr and get the next case. These simple steps are the exact same operations that more extreme case forming will require. It may require more length reduction, but it's not a bit more complicated.

The next step up is slightly more expensive, but also elegantly simple. It is a die that you insert into your press, and use the ram to push a case up into it just as if you were resizing it. It is made such that when the press is bumping the bottom of the die, any brass protruding from the top of the die is excess neck length. The die is hardened so that a file will not cut it, so you trim the excess off with a hand held file. This is a bit more versatile, in that if you want a little longer neck for some reason, you can simply back the die off a little, and set it to any length you want. In fact, there is nothing preventing you from using a file by hand, but I don't recommend it: The end result may be safe, but it won't be square and neat unless you're a lot better with a file than I am.

Probably the most frequently used equipment today is a miniature lathe device supplied by a number of manufacturers. They use a face cutter not unlike the Lee trimmer, but are infinitely adjustable for length, as well as offering options for other operations like neck reaming. Because of their versatility, they are probably the best choice for any reloader. You will find you need them after most case forming operations because case forming will almost always provide a greater length than you want.

Try a little thought experiment to understand how and why resizing will lengthen your case. Imagine a roll of putty about the size of a cigarette in your hand. Now imagine closing your fingers and squeezing hard. You will 'see' in your mind how the ends of the putty will be squeezed out of the sides of your fist. In principle, this is exactly what happens to a brass case on a much reduced scale. The case has to be notably smaller than your chamber if it is to be easy to insert. But when you shoot, pressure expands the case to fill the chamber. If you bought one of those calipers mentioned above, you can measure the expansion. In fact, you can often actually see it with your naked eye.

If you are using a fairly mild pressure round, you can often reload and reuse it without sizing, but sooner or later, it will begin to stick or not chamber freely. Now you have to resize it, which is a fancy word for squeezing it back down to a smaller diameter that will chamber freely. When you do, the squeeze causes the case to be a bit longer, just like squeezing the putty made it longer. That's why most reloaders will have to deal with trimming, sooner or later.

Now let's move a bit closer to what most folks think of as case forming. The next step is to change the diameter of the neck. This is an easy step that's often done by nothing more than running the case into the reloading dies for the new round. Examples would be converting a .308 Win to .243 or even a .358 Win, or a .250 Savage into a 22-250. But remember that the brass you squeeze down has to go somewhere. After you form the cases, check them for not only length, but also for neck thickness. If the neck is too thick, the loaded round may not be able to open and release the bullet easily when you shoot. The same problem can come from setting the shoulder back to form another case. For example, consider setting the shoulder back on a 30-06 case to make an 8x57 case. Thickness of a case increases as you move down from the case mouth, so the neck of the 8x57 case you just formed will be made with brass that is much thicker than normal for a neck. The neck reaming function of the lathe type trimmers will solve the problem easily. Of course, it's just as easy to go the other way too: You can expand the neck of a 22-250 case to work in a 250 Savage. In this case, the neck won't thicken, but I'd still recommend checking the length: The case you started with MAY have been too long! It may not be likely, but I have seen it happen.

In principle, you can convert almost any cartridge case to another as long as the diameter of the base is correct. It's a lot of work, but it IS possible to convert say, a 30-06 into a 22-250 case. At least, you can get a case that will chamber, if you are careful to ream and trim the resulting case properly. But getting there can be a real chore. First of all, you will have to anneal the case so that it won't collapse into wrinkles when you size it down, or perhaps split the neck when you expand it. Either will utterly ruin the case. And you will have to use a really good sizing lube. But the resulting case will have a lot less internal capacity than a normal 22-250 case. They'll be shootable, but not with normal loads, for the sake of safety. The reduced internal volume will result in higher pressures for a given load. You must not try to use a max normal load in such a case. In fact, it is possible to enlarge the base and extend the body of the case to produce almost any case from any other case. In theory, one could make 45-70 cases from .22 Hornets. I have never done it, nor do I expect to. But if necessary, I would know how to get the job done: anneal the Hornet case; insert it into a base machined to 45-70 dimensions and fire-form. Then slip a length of brass tubing over the fire-formed assembly and fire-form again. Trim to length and start load development.

It is often necessary to make haste slowly, if you don't want to lose half your cases. For example, if you need 358 Winchester cases, you CAN make them from .243 Win cases. But you'll lose most of them if you don't do it in steps. Working brass makes it harder. Make it too hard, and it'll split on you. To avoid this problem, you will have to anneal the cases, perhaps several times. Annealing softens the brass, and it's easy and safe to do if you follow instructions. The simplest method is to stand the case on its base in a shallow flat pan that contains perhaps 3/4 or an inch of water. The water is to keep from annealing the base and weakening it. Now use a propane torch to heat the mouth of the case. You don't want to get it cherry red, though I did so for years without any problem at all. But as it heats, you will see a yellow or greenish color come into the propane flame. Stop heating, and use your finger (or a stick) to flip it over into the water. The case is now softened, and can be expanded or sized considerably without loss. For extreme examples like the .243 to the .358 win, you may need to first expand the case in steps, annealing between each sizing. Go through the easily obtained dies and enlarge the neck from .243 to .257 to .284 to 30 caliber and go on up to .358 win. The case loss can be greatly reduced if you simply understand what you are doing to your brass, and adjust your operation accordingly. And the cases you can make like this will work as well as factory made cases.

The next step up in complexity is probably altering cases to fit smaller chambers. For example, it is possible to swage or size not only the mouth and shoulder of a case, the base can be sized as well. If you happen to have one of the 6.5X54 Mann/Schoen rifles, cases with a .444 diameter base can be tough to come up with. But the .470 base of a .308 can be swaged down as a make do.

You don't want to get too radical when swaging the base of a case down. Remember that swaging or sizing will harden the brass. A hard brass base can split under the impact of firing, and give you a face full of powder, flame and hot brass particles. This can do terrible things to your insurance rates, as well as split stocks and generally make you unpopular with other shooters on the range. I'm not comfortable sizing a base more than 0.03 or 0.04 inches except for very mild loads. When I need greater reduction, I go to another technique: The case walls above the base are pretty thin, relatively speaking. It's not too hard to run a case into the proper sizing die that you are trying to make cases with. Run it in until the resistance builds up a bit and take it back out. It'll look strange when you remove it, and will sorta resemble a soda straw stuck into the center hole of a spool of thread to one degree or another, depending on how severely you reduce the body diameter. Now chuck the case in a lathe and turn the base down at high speed, so you can get a nice smooth finish. Now fireform, trim and ream the neck. This is also the time to trim the rim, if you need to. I've done this with 348 Win cases to convert them for use in an 11 MM Mauser. Now, new cases are available for the 11 MM, but the same technique will work for any combination, if you just use some common sense as you work. Also note that this is a neat way to generate a rimmed case if you need one. Just start with a case whose base is pretty close to the rim diameter you need, and don't turn the base off when you use the lathe on the body.



It's also quite possible to build up cases to fit larger chambers. Find a case with a rim that meets your needs, and drop by the local hobby store and ask for telescoping brass tubing. You can press brass tubing over your case in as many steps as needed to build the proper diameter. Let the first tubing length extend about 1/8 inch past the case, and make the succeeding tubes be about 1/16th longer than the preceding tube. Continue building until you have the proper base diameter. Trim the rim to fit your extractor, and fireform with a moderate load. The case body will expand to trap your lengths of tubing between the rim and the expanded case. With proper care and periodic annealing, these will last as long as a factory case. But be very sure to work your loads up gradually with these cases. They will have notably less internal volume than factory cases, and ordinary load data for the round will give higher pressures. Possibly dangerously high pressures too.

I've actually used ordinary scotch tape for this too. A lot of war 'bringback' rifles were re-chambered because there wasn't any factory ammo here in America for them. This re-chambering would permit use of common cases, though they frequently had too small a base. Re-chambering a 7.7 Jap and loading for it with trimmed and resized 30-06 cases was common. So were split bases spewing gas back in the shooters face. But a few savvy shooters noticed that split cases were almost always where the case expansion was greatest. They wrapped scotch tape around the base of the case so that the case was centered in the chamber, and the problem went away. The centered case didn't expand unevenly, but expanded equally around the base. So there weren't any spots where a weak spot could be split from overstressing. As long as loads were kept moderate, this actually worked very well.

Another good use for telescoping tubing is to give you a longer case. For example, say you want to shoot a 45-125 Winchester Express, but all you can find at a reasonable price is 45-70, which is much too short. But you can size the body of the 45-70 case down and (using a little epoxy) press some tubing of the proper diameter over it to make it any length you want. And don't get bent out of shape over a few thousandths of an inch if the tubing OD isn't exactly what you want. For one thing, they are available in pretty fine and precise diameter graduations. You'll have to be pretty picky if one of them won't serve for you. The hobby shop can get you almost anything you want. And for another thing, they will expand just like cartridge brass. If they aren't a precise fit at first, they will be after you fire-form them.



You can even make rimmed cases out of rimless. Find some thick, soft copper tubing that your rimless case will fit into easily. Now cut out the bottom of steel rod or a suitable discarded reloading die so that it will just slip over your rimless case. Now cut another recess that the soft tubing will just go into, but make it the diameter of the rim you want, and with a length that is a bit deeper than the extractor groove of your rimless case. Cut a length of soft tubing and drop it over your case before you set the steel die down over the assembly. Now take a sledge hammer, and take your frustration out on the top of the steel rod or die. The copper will upset into the extractor groove, and make you an oversized rim, which will have to be trimmed back to the right size. This is probably more easily done with a good hydraulic press, but I never had access to one of them when I needed to form rims.



Here's another way, if you don't like that one. Look at the measurement tables and find a case with a length at least as great as the case you want to make, and a somewhat smaller diameter. Find some steel, brass or even zinc rods of at least the diameter you want your rim to be, and take them to a machine shop if you don't have the equipment yourself. Instruct the machinist to turn the rods to the rim and base diameter you want, and specify a length about half an inch more than the thickness of the web in the cases you want to use. Tell him that you want about a 60 degree chamfer at the muzzle end of the adaptor, which is to be drilled to a mild press fit over your chosen test case. I will refer to this later as a 'machined base'.

Now go home and anneal the cases you want to use. When you get the machined base back from the machine shop, take a Q-Tip and give the inside a light coat of 30 minute epoxy before you press the annealed cases into place. Let them set up, and formulate a fireforming load of FFFg, and top it off with a wad of paraffin to hold the powder in place during handling. Now fireform your cases. You'll find that the annealed cases have expanded to fit the machined base's chamfer and the rest of the chamber. Clean both rifle and cases to remove residue and prevent corrosion, but you will have a supply of cases that should last you slightly short of forever. And if / when you do lose one due to splitting, just heat the adaptor with a propane torch until the epoxy breaks down. That will let you push the damaged case out, and recover the adaptor for re-use.



Be aware that by definition, older guns were not made with modern steels, no matter how fine the workmanship in them may be. Treat them accordingly. And one thing above all: You **MUST** realize that cases made by these processes will usually **NOT** have the physical properties and internal volume of factory cases. If you're just expanding or sizing the neck, that's not a problem. But more extensive operations to adapt a case to a gun it was not intended for will generally not be safe with loading data for the original case. Milder loads – usually **MUCH** milder loads are **MANDATORY**. If you want magnum performance, buy a new Remchester in a caliber that gives you the power you think you need, and get a box of factory ammo to use in it. But if you just want to get your great grandpa's rifle talking again, treat it with the respect (and the caution) that is appropriate for old guns with unknown history and metallurgy. Use cast bullets if possible. They won't wear the rifling in older, soft steel barrels, and they can be adjusted to fit the bore of Ol' Betsy. Many gun makers of days gone by were rather blasé about bore diameters. If you can understand that, and are willing to accept those limitations, you may enjoy the satisfaction of putting some fine old relic back into good service.