

UniqueTek “Tips” File #8: “Cartridge Case Lubrication”

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By Lee Love

Lubricating cartridge cases would seem to be so simple as to not need a “Tips” file. But perhaps it’s not that simple. For starters, it is certain that there are more opinions about which case lube is the best than there are case lubes on the market!

This “Tips” file is not an “A” versus “B” evaluation. There are just too many factors involved to state that any one case lube is superior in all situations. The intent here is to provide sufficient information so that you can make an educated decision on the appropriate type of case lube, or lubes, to meet your needs.

Types of Case Lubes

Case lubes generally fall into four categories; oils, waxes, water soluble lubes and dry lubes. There are many products currently available of all four types, and just about every press or die manufacturer sells one or more of them. There are also many “home grown” lube formulations that you can find on Internet forums that are based on lubricant products originally formulated for purposes other than reloading.

The following list contains most of the commercially available lubes, and a few “home grown” lubes. I’m sure there are other products available and their absence from this list should not be construed to be an assessment of their merit. This list is also not intended to be an advertisement for any of the products listed and I have no financial interest in any of the companies or products. Also, please keep in mind that I may not have all of them sorted into the correct categories, as the manufacturers tend to keep their formulas a closely guarded secret.

Oils:

Oil-based lubes can contain just about any type of oil including animal, vegetable and petroleum oils, or combinations thereof. Petroleum oils tend to pose the greatest risk of powder contamination or “killing” primers. And some oil-based lubes may actually be a blend of oils and waxes. In fact, it can be argued that lanolin is actually a wax but I’m staying away from chemistry lessons in this tips file. You will notice that many lubes (and not just oil-based lubes) are now available in pump spray bottles. This is primarily due to the increased restrictions on shipping aerosol cans, especially international shipping.

Dillon Rapid Lube 5000 Case Lubricant (lanolin in alcohol / pump spray)
Forster High Pressure Case Sizing Lubricant (petroleum based / liquid in screw cap bottle)
Frankford Arsenal® Case Lube Pump (formula uncertain / pump spray)
Hornady® Case Sizing Lube (formula uncertain / liquid in squeeze bottle)
Hornady® Unique™ Case Lube (animal fats [mink oil?] / hard paste in a plastic tub)
Lyman Case Lube (formula uncertain / liquid in squeeze bottle)
Lyman Qwik Spray™ (petroleum based lube / aerosol spray)
RCBS® Case Slick® Spray Lube (formula uncertain / pump spray)
Redding Original Formula Case Lube (formula uncertain / liquid squeeze bottle)

Wax:

Wax based lubes can contain almost any type of wax or combination of waxes, including paraffin, bees wax, carnauba wax, and yes, lanolin to name just a few.

Hornady® One Shot™ Case Lube Spray (various waxes dissolved in a solvent / aerosol spray)
Hornady® One Shot™ Case Sizing Wax (solid / metal tin)
Imperial® Die Wax (solid / metal tin)

Royal Case & Die Lube™ (jar)
Royal Case & Die Lube™ (aerosol spray)

Water Based / Water Soluble:

Water-soluble lubes were developed not as much due to environmental or toxicological concerns, but because they are not supposed to contaminate powder or “kill” primers. They are also easier to clean off the loaded cartridge. The ingredients are closely held secrets but they may contain either waxes or emulsified oils. It seems to not make any sense but some waxes actually are water-soluble. Oils are not water soluble, but they can be emulsified with certain additives (I’ll not get into the chemistry) so that they become water-soluble. Emulsified oils typically look milky white.

Hornady® One Shot™ Non-Hazardous Case Lube (water based / pump spray) – [Discontinued]
IOSSO® Sizing Lubricant & Cleaner (water based / pump spray bottle)
LEE Resizing Lubricant (water soluble wax / squeeze tube)
RCBS® Case Lube 2 (liquid)
Redding Water Soluble Case Lube (water based / squeeze bottle)
Redding Imperial Bio Green Case Lubricant (plant based / water soluble / squeeze bottle) – NEW in 2012

Dry Lubes:

All of the dry lubes are fine dry powders and typically come in a small jar or just a plastic bag. Some come with, or are available with, an applicator such as a jar full of very small steel or ceramic ball bearings. Details on application methods are discussed later in this document.

Forster White Motor Mica (mica / dry powder)
Frankford Arsenal® (mica / dry powder)
Imperial® Dry Neck Lube (graphite / dry powder)
Neco Super Deluxe Dry Neck Lube Kit (moly / dry powder)

Other Products I’ve heard used as case lubes:

Many reloaders use products that aren’t sold as a case lube, mostly to save money. And some swear that some of these products make superior case lubes. But using them should be approached with great caution. You have a lot of money invested in your dies to risk ruining them by trying to use a “less expensive” case lube. Especially with high viscosity lubricants, like castor oil and motor oils, it is easy to apply too much resulting in hydraulic dents on case necks.

Ballistol® Lube (wax/modified / aerosol spray)
Castor Oil (added to isopropyl or denatured alcohol)
Gardner Bender Wire-Aide™ (lubricates electrical wiring for pulling through conduit) ¹
KIWI™ Mink Oil (leather shoe dressing)
Lanolin + Isopropyl Alcohol (home made Dillon lube)
PAM® cooking spray (vegetable oil)
Saddle Dressing (Brand unknown but a type that is bees wax based)
Silicone Spray Lube (no brand specified)
STP® Oil Treatment (a high-viscosity motor oil additive)

What About Silicone or Teflon® Lubes:

SI’ve never heard of a commercial case lube that is either silicone or Teflon® based, and there appear to be valid reasons why not. Teflon® lubricants contain Teflon® particles suspended in an oil-based carrier.

The Teflon[®] particles can actually melt under the heat created by the extreme pressures. I talked with a representative from one press manufacturer who explained how he jammed up a press when experimenting with a Teflon[®] lube on the press ram.

With regards to silicone lubricants, it appears that silicone may not function well under extreme pressure applications. To quote from a Dow Corning paper on silicone lubricants “Load is a limiting factor for silicone lubricants, particularly in metal-to-metal lubrication”.²

Applying Case Lubes

Applying case lubes correctly is just as important as the type of case lube you choose. The case lube you use may come with instructions or recommendations for its use and it is generally a good idea to give a good read through just to make sure you are maximizing the performance of the lube.

Regardless of the lube type or application method, over applying can cause problems including dented shoulders on bottleneck cases and excessive buildup on dies. Not to mention that excess lube in the wrong place usually gets spread to all sorts of places it was never intended to get.

Lube Pads

Lube pads are the oldest and most basic lube applicators. They are still around for good reason. They are simple, easy to use and you get a uniform coating of lubricant with just a quick roll across the pad. The pad can be wool felt, foam or cotton fabric over foam (e.g. Lyman) and are usually about 1/4” thick.

As simple as a lube pad looks, there is still some technique involved. To judge if the pad has the correct amount of lube applied, wipe the tip of your index finger across the lube pad, then rub your finger and thumb together. There should be just a "sheen" of lube on your fingers.

To lube brass, place a few cases on the pad and gently roll across the pad. Don't place so many cases on the pad that there isn't enough room to roll them at least one full revolution. One pass is enough and there is no need to roll back and forth multiple times. There is also no need to press down hard. Pressing down hard is one way of applying too much lube. If you lube some brass then look at it closely, you should not be able to see any drips, sags or runs. The lube should leave no more than a “sheen” on the brass, just as it did on your finger.

When you roll bottleneck cases across the pad, you will notice that the neck will not contact the pad at all. You generally don't want to apply lube to the shoulder (unless you are using a bushing bump die or a reforming/conversion die) as this can cause hydraulic dents. If you do need the shoulder lubed this can be easily done by simply picking up each case by the case neck with the fingers of the hand you used to roll the cases. This will transfer lube from your fingers to the neck. Also keep in mind that you may want to lube the inside of the case neck to minimize case stretch ... and you may want to use a dry lube on just the neck. To do this you first dip the case neck into the dry lube then roll on the lube pad. Of course, you can also do it in reverse order. I've heard logical arguments for both, but either way will still get the job done.

Tip: Make Your Own Lube Pad

One trick I've heard is to buy a stamp pad (un-inked). Don't bother with your local office supply or art & craft supply stores, I checked all the major stores and none carried un-inked pads or pads large enough for

most rifle cases. But there are plenty to be found in the Internet. You can even find adhesive backed felt inkpad material in 8"x10" sheets that you can use to make your own custom size lube pad.

One unique twist on a lube pad was the Redding Lube Tongs. The tongs had a small felt lube pad attached on each side. You just held the case by the neck, squeezed the tongs around it and give a little twist. It was a one-at-a-time operation but got the job done. Unfortunately, this product was discontinued a few years ago. I mention it here, as there are likely many of them still on reloading benches ... or forgotten in a drawer.

If you are loading a few dozen precision rifle cartridges, a standard lube pad is more than adequate. But if you have a progressive press and need to load several hundred rounds of pistol ammo for a weekend pistol match, a lube pad is too slow to keep up with the press. But what can you do if your lube of choice does not come in a spray bottle. Well, you can always "Super Size" your lube pad.

Tip: Super Sized Lube Pad

Buy an aluminum cookie sheet and a synthetic chamois (or several sheets of the ink pad material mentioned earlier). Cut the chamois to fit the bottom of the cookie sheet and glue it into the cookie sheet using a hot glue gun. Apply case lube to the chamois then roll your cases across the chamois. You can process a LOT of brass in just a few minutes. Buy two identical cookie sheets and use the second as a cover by nesting it on top of the lube pad.

Solid Wax Lubes

Solid wax lubes come in a small tin or plastic tub. You just rub your thumb, index and middle fingers across the surface to put a "sheen" on your finger tips. Then roll the case between your fingers to apply lube as you are inserting the case into the shell holder. There will be enough wax on your fingers to lube several cases without needing to return to the lube tin for every case. Royal Case & Die Lube™, being a soft paste consistency, may also be rubbed onto a lube pad for application.*

* The aerosol version of Royal Case & Die Lube™ can also be sprayed onto a lube pad.

Tip: Skid Proof your Resize Wax Tin

The small metal tins that resizing wax comes in tend to skid across the reloading bench while you are trying to get the lube on your fingers. The base of the tin will usually fit into the lid. Drill a small hole in the center of the lid and attach it upside-down on the bench with a small screw. Then place the tin of lube into the lid and it will keep the tin from sliding across the bench when applying lube to your fingers. When not in use, just flip over the tin of lube and place it back into the lid. It's upside down, but since the lube is a solid, it can't spill. If you don't want to put a screw hole in your bench top, you can use a piece of double-sided tape.

Spray-On Lubes

What could be simpler than just spraying on lubes? Well, depending on the type of lube, it may not be all that simple. With aerosol wax lubes (e.g. Hornady One-Shot™) you can do just that. Spray it directly on the cases, wait a few minutes for it to dry and start reloading. Wax based lubes won't effect powder or primers, so any that happens to be sprayed into the case mouth or primer pocket is not a problem. But you must allow them to dry before loading, and dry times can vary significantly from product to product. For example, Hornady One Shot™ Non-Hazardous case lube is the same formulation of waxes as in One Shot aerosol, but in a more environmentally friendly solvent that works in a pump spray. Pump spray bottles don't produce as fine a droplet size as aerosol spray cans, and the solvents don't dry as fast, so longer dry times are typically required.

But not all lubes that come in a spray bottle are immune to problems. For instance, Dillon Case Lube (lanolin in alcohol) comes in a pump spray bottle. The recommended application method is:

"Place your clean brass in a shallow box so the cases are laying on their side. Pump a couple of sprays of Dillon Case Lubricant over the cases. Shake the box so the cases will tumble and roll. Repeat this process again making sure that the lubricant is well distributed over the cases. After lubricating the cases, let the lube dry for about five minutes." ³

But spraying it directly on cases, and getting it into the case mouth, can cause problems. Here is a quote from a customer.

"I tried spraying the lube directly on the cases and noticed that, regardless of how I did it, some lube always got into the mouth of the case. This caused the powder from the powder bar to stick to the mouth and sides of the case and not fall to the bottom of the case with the rest of the charge. Seating the bullet crushed some of the powder against the belled case mouth and pushed the rest into a clump at the base of the bullet. So an otherwise accurate powder charge falling from the powder bar did not end up in the bottom of the case as it should have." ⁴

Of course it is possible that he was applying too much lube and/or not waiting long enough for it to dry. And I'd expect that other similar case lubes could have a similar problem. But his "cure" for this was simple. He sprayed the lube on a cloth and then used the cloth to wipe lube onto a handful of cases just before tossing them into his case feed hopper. I thought this was an effective and elegant solution to the problem.

Tip: "Spray Tray"

A cookie sheet is also handy for applying spray lubes, especially those that pose no threat of powder contamination or "killing" primers. For many years I've used a cookie sheet to apply Hornady One Shot™ on pistol brass. I just load up the cookie sheet with a single layer of brass, leaving enough free space so that I can roll the brass a bit. I spray one side of the brass, and then tilt the pan a bit to roll the cases over and spray the other side. Cookie sheets come in a variety of sizes so you can select a size that is convenient for your needs.

Keep in mind that, especially with bottleneck rifle cases, it is important to get complete lube coverage or you may risk a stuck case. This is one of the potential drawbacks to spray lubes. To help minimize this possibility, you can pre-lube the die before running any of the cases. After cleaning the die, I apply lube to a cotton swab then use the swab to apply lube inside the die. Remember that only a very light coating is needed. By lubing the die it is protected even if that first case isn't 100% lubed.

Dry Lubes

Dry lubes are a special case and you should follow the manufacturer's instructions to get the best results.

♦♦♦ **Never use specialty dry neck lubes for full length resizing as it will result in stuck cases!** ♦♦♦

Redding Reloading recommends that Imperial Dry Neck Lube (graphite) be applied using their own "Imperial Application Media". The "application media" is a small plastic tub filled with tiny (≈ 0.05 " dia.) ceramic spheres. You just dip the case neck into the spheres. The ceramic spheres transfer graphite to the case neck in a way that minimizes over application. According to Redding, you can lubricate 400-500

cases before needing to replenish the graphite. An added benefit is that graphite is commonly used in gunpowder manufacturing, so there is absolutely no worry about contaminating the powder.

NECO Neck Dry Lube kits are very similar to the Redding product but use ground, stainless steel balls instead of ceramic balls to apply powdered moly (molybdenum disulfide) lubricant to the case neck. The technique is the same. Just dip the case neck into the container.

Frankford Arsenal recommends that their fine ground mica be applied by first dipping the case mouth in mica then pushing it over a nylon brush (like a bore brush). No steel or ceramic balls are used to apply the mica and the brush serves to both evenly distribute the mica and to remove any excess. Frankford Arsenal makes a neck lubricator station that has a well to fill with mica and a socket that holds a nylon brush. The lubricator station can be used dry (e.g. with mica) or wet (with your lube of choice). Either wet or dry, the method is the same except that “wet” lubricants may need time to dry.

Lube Die™

One of the more recent innovations in applying case lubricant is the RCBS® Lube Die™. This is a decap only die body with a felt bushing and a small reservoir to hold lubricant inside the die body. The cases get lubed and decapped in one operation. The felt bushing surrounds the entire case diameter ensuring there are no missed spots on the case. Unfortunately, it may not work with most progressive presses as there needs to be an open die location. For instance, I can't use it on my Dillon press because I'd need an extra die location between Station 1 (resize/decap) and Station 2 (prime/powder drop). If I called that extra station “Station 1B” the sequence would be; Station 1 (decap/lube), Station 1B (resize), Station 2 (prime/powder drop). But if you are using an RCBS® Pro 2000® (5 die stations), Turret Press (6 die stations) or Piggyback™ you will have die stations available to use the Lube Die. Refer to the instruction manual for these presses for complete details.

Choosing a Case Lube

In short, the case lube you choose depends heavily on what you are doing. So you may find that you will need to keep more than one type of lube on hand for different tasks. The lube can also affect the amount of “draw out” or case lengthening that occurs when the case neck expander ball passes through the case neck. In general, the more effective a lube is, the less “draw out” will occur. Upgrading to a carbide expander ball is also highly recommended.

Full-Length Resize Dies:

Full-length resizing requires a standard case sizing lube. Do not use specialty dry lubes intended for neck sizing rifle cases (e.g. graphite, moly or mica). This can result in a stuck case. Just about any of the standard (oil, wax or water-soluble) case lubes will get the job done. I recommend that you try several products and see which one you like the best. To keep the cost down, you can ask your shooting buddies what they use and maybe borrow their favorite lube for testing.

Neck Sizing Dies:

For neck sizing, you can skip the lube pad as you only need to lube the case neck. Specialty dry lube products (e.g. graphite, moly or mica) are often considered the best way to go. They will not contaminate powders and are easy to apply to just the case neck. They are usually applied by simply dipping the case neck into the container, lubing both the inside and outside of the case neck at that same time. With some products, the inside of case necks is brushed after application with a nylon brush similar to a bore brush.

Lubing the neck is especially important as an effective lube minimizes stretching. Upgrading to a carbide expander ball is also highly recommended.

Bushing Bump Sizing Dies

Bumping back the case shoulder requires a lot of force and a good high-pressure lube is recommended. The die manufacturer will often recommend a product and it is usually a good idea to at least read their recommendations. For instance, Forster recommends using their own “High Pressure Lube” with their Bushing Bump Sizing Dies. Of course you can use other lubes but it never hurts to check how closely the recommended lube compares to what you were planning to use.

Small Base Sizing Die

Small Base Sizing Dies are essentially nothing more than a standard full length sizing dies that have been machined to absolute minimum dimensions. Some firearms have tight chambers and require that case dimensions be restored to near unfired dimensions to allow the reloaded cartridge to be easily chambered. As you would expect, more force is being applied than with a standard full-length sizing die. The same lubes recommended for full-length resize dies can be used here but you may find it beneficial to use one that is recommended for higher pressure sizing operations such as reforming or conversion dies.

Another type of base sizing die is the Redding G-R_x Push Thru Base Sizing Die, which is designed to restore fired cases with a bulge near the base as a result of being fired from certain .40 S&W auto loading pistols. The die is unusual in that the case is pushed completely through the die and out the top. As with all small base sizing dies, it works the brass more, especially at the web. Redding recommends Imperial Sizing Die Wax and it is a widely used and respected product. Although you could use any of the lubes recommended for full length resize dies, this is one application where I personally prefer to use a wax based lube. Since this die must be used in a single stage press and each case must be handled, I just use the recommended Imperial wax rather than a spray-on wax and keep the fingertips of my left hand coated with lube as I feed each case onto the shell holder with my left hand.

Reforming or Conversion Dies

These dies are used for reforming a cartridge case from one size to another, usually to make obsolete or wildcat cartridges for which there is no commercially available brass. This is often a multi-step process and the maximum amount of work is being done to reshape the brass. Again, any lube that is recommended for full-length resize dies would probably be a good choice but you should take a look at what the die manufacturer recommends (RCBS recommends their Case Lube-2 with their reforming dies).

Carbide Dies: To lube or not to lube?

If you're not using a carbide sizing die, you must lube all brass before sizing. That includes straight-walled pistol cases and nickel plated cases. If you are using a carbide sizing die, it is not necessary to lubricate straight-walled cases before sizing, but all bottlenecked cases must be lubed. However, I strongly recommend lubricating all brass before sizing even when using carbide dies. Lubed brass requires significantly less effort to resize and makes the reloading press operate much smoother.

Another good reason to lube all brass, even when using a carbide sizing die, is to facilitate crimping. The crimp die, whether taper crimp or roll crimp, applies significant force to the case neck. And crimp dies are steel, not carbide. A lubed case will smooth the crimp process, reduce the force needed, and prevent sticking ... especially when loading new brass. Below is an example submitted by a customer.

“I reload straight wall pistol cartridges and use a carbide resizing die for each caliber. The die manufacturer said I didn’t need to use case lube so I did not at first. But what happened was the case was getting 'stuck' in the crimp die and it took extra force on the down stroke of the ram to remove it. I checked around and talked to brass and press manufacturers and they said to try lubing the brass. I did and the problem was solved. So while all the lube discussion is centered on the sizing die, I have learned it is also beneficial to the crimp die.”⁵

Removing Case Lube

Once your cartridges are sized (or fully loaded if you are using a progressive press), it is usually recommended to remove the case lube. In most cases this is as simple as wiping cartridges, a handful at a time, between paper towels. I prefer to use cotton rags (e.g. an old T-shirt) but some prefer terrycloth. Cotton rags don’t tear and leave residue on the cartridges like paper towels can.

Most often you will just wipe with a dry cloth, but water-based/water-soluble lubes are removed with a rag dampened with a little water. Imperial Sizing Die Wax is allegedly easier to remove if you add a few drops of lemon juice to water on a lightly dampened rag. Using a rag dampened with a soap and water can often facilitate removal of oil-based lubes. Liquid dishwashing detergent appears to be the favorite soap.

Some prefer to clean off lube using their case cleaner and corncob media. This is an especially handy technique if you are loading larger volumes of cartridges on a progressive press. You should use clean corncob media and keep it in a separate container so you use it only for cleaning lube off cartridge cases. Also, make sure you aren’t using corncob that has been treated with polishing compound. It isn’t that the polishing compound will harm anything, but you want the corncob to be as absorbent as possible. Plus, plain corncob is cheaper.

If you are loading on a progressive press, you will not be removing the case lube until the cartridge is fully loaded. There are numerous Internet forum discussions on the potential danger that a primer could be detonated by removing case lube in a case polisher, although I’ve never heard of such an incident actually happening. To me, the risk would seem much greater of this actually happening in a tumbler type polisher than in a vibratory polisher. If you do decide to use your case polisher, do so at your own risk! Also, don’t clean loaded cartridges very long. There is a possibility that the powder grains may be altered by running it too long and that could alter the burn rate of the powder, yielding unpredictable chamber pressures. Regardless, you should not need to run it for very long as you are only cleaning off the lube, not trying to polish the case. No more than 30 minutes seems to be the consensus from the Internet forums, but I’d keep the time as short as possible. The time will likely be different depending on the lube you are using. I’d suggest running it in five-minute intervals and inspect after each interval until you determine the optimum cleaning time.

It is generally agreed that, regardless of type of lube or method of application, all traces of the lubricant should be removed from the case before firing. The primary concern is with “bolt thrust”. A clean dry brass case gets a lot of “grip” on the chamber walls when fired; limiting the amount of force the case applies to the bolt face. A well-lubricated case will get less “grip” on the chamber wall and apply more force to the bolt face. According to one reloading expert I talked with, bolt thrust is of greatest concern in bolt-action rifles chambered for “high pressure cartridges with a low bearing area [chamber contact surface area] and a small diameter case head”.⁶ On the other hand, if you are shooting a “gas gun” the

small amount of remaining case lube can actually be of benefit by ensuring more reliable extraction. As with most aspects of reloading, it all depends on exactly what you are doing.

If you use an ultrasonic cleaner to clean spent brass before reloading, keep in mind that any residual case lube that comes off the cases, tends to float on the surface of the ultrasonic cleaning solution (assuming a water based cleaning solution). When you lift the cleaned cases out of the ultrasonic bath, the oil film will redeposit on the cases. But if you use a water-soluble case lube, this will not be a problem. This is one of the major advantages advertised by Redding Reloading regarding their new Imperial[®] Bio Green Case Lubricant.

A customer made this suggestion...

“What I would love is a case lube that totally evaporates in 2 -3 hours after applying. In that way there is no need to remove the lube after reloading.”⁵

I told him; “You, me and a few million reloaders all would like a case lube that evaporates 100% after reloading.” Alas, that technology just doesn’t exist at this time. The challenge is that any lubricant that would be capable of evaporating in an acceptably short time, would be unlikely to be an effective lubricant under the very high loads exerted during the reloading process.

Closing Thoughts

I hope you find this “Tips” file informative. It may not answer all of your questions about which is the “best” case lube to use, but it should give you enough information to point you in the right direction. I know I learned a lot more about case lubrication than I expected while conducting the research. And thanks to all of the manufacturers reps for taking the time to discuss their products with me in such great detail, for answering all my questions, and for sharing their personal insights. Thanks also to those manufacturers who sent product samples. And last but certainly not least, thanks to the customers who shared their personal experiences.

References:

1. References to using Gardner Bender Wire-Aid for case lubricant were found on the following internet forums:
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<http://www.surplusrifle.com/shooting/brasstrimming/index.asp>
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2. M. Jungk, Dow Corning GmbH, Wiesbaden (Germany); “Silicone Lubricants in Industrial Assembly and Maintenance”, Chapter 18, page 3.
3. “Lubricating Brass”, Dillon XL 650 Instruction Manual; May 2007, page 9.
4. Charlie F., Email from Charlie F. to UniqueTek, Inc. 9/1/09.
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6. Sharpless, R. L., Redding Reloading Equipment; Cortland, NY; telephone interview on October 6, 2009.

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