

# Rifle Bore Lapping/Polishing

Fred Bohl – 26 April 2005

## BACKGROUND

For those interested in the best possible accuracy and precision, whether for competition or just their own satisfaction, their custom or semi custom rifles begin with the best custom barrels. Those barrels, whether button rifled (from: Broughton, Hart, Lilja & Shilen) or cut rifled (from: Badger or Krieger) all share a common and critical processing step – hand lapping!

The purposes for lapping the bore are:

1. remove tooling marks left from the rifling process
2. ensure a dimensionally uniform bore, end to end
3. provide a uniform, clean, polished interior finish that follows the direction of the rifling groove spiral

The benefits of lapping the bore are:

1. more consistency in velocity and accuracy
2. eliminates much of the break-in process
3. less copper and powder fouling
4. the barrel will clean much easier (less solvent, patches and effort)
5. reduced difference in point of impact between clean and fouled barrel

In practice, a lead lap is cast inside each barrel creating a lap that is formed perfectly for that particular barrel. Next, the lap is pushed out of the bore and deburred. Then a lapping compound, which is an abrasive suspended in a lubricating medium (that eases the cutting action and carries away the residue created), is liberally applied to the lap. The lap is guided back into the barrel and the pushed and pulled through the barrel until the barrel maker feels an even resistance. The actual process can take hundreds of strokes, usually three laps and require about an hour on each barrel by an experienced practitioner.

This process is done to a barrel blank after boring, rifling, contouring and straightening, but before chambering and muzzle crowning. Blanks are made long so that the muzzle end can be cut off and crowned to remove any damage caused by the lap effects on the bore edge.

The gunsmith will turn and thread the breach end, ream the chamber, trim the barrel to finished length and crown the muzzle. Depending upon the services offered and ordered the chamber, throat and crown may also be polished.

## **FACTORY BARRELS**

Currently there are three principal levels of factory made rifles and associated barrel processing:

1. Semi-custom – with lapped barrels and polished chamber-throat-crown
2. Semi-custom – with lapped barrels but no polishing
3. Commercial – no lapping or polishing

Other than the information offered by the manufacture or dealer there is little that the buyer can do to ascertain the bore conditions prior to the sale. After taking delivery of a rifle and before firing it, do one or both of the following:

1. Clean the bore using one solvent moistened patch followed by two dry patches using a properly sized jag and solid rod taking note of the effort required – a slip/stick irregular stroke indicates rough finish while an even easy stroke indicates a lapped bore.
2. If accessible, have an experienced user check the bore with an illuminated borescope including the chamber, throat and crown.

Note, for used rifles (irrespective of manufacturer or seller), the above initial cleaning and inspection of the bore is probably more important.

## **OWNER/USER OPTIONS**

Conventional Break-in — various sequences of shoot and clean using conventional ammunition to burnish the irregularities in the bore and throat surface finish – for example (commercial new barrels):

1. Clean rifle prior to first shot-- ignore accuracy and just shoot.
2. Clean after every shot for the first 10 shots.
3. Clean after every other shot from 11 to 20 shots. \*
4. Clean after every 5 shots from 21 to 50 shots. \*
5. After 50 shots, completely clean and you are ready.

\* Do not over heat the barrel – less than 1 shot per minute

For Custom or Semi-Custom lapped barrels, this may not be necessary.

Fire-Lapping — cartridges made with bullets coated with fine abrasives are fired in strings of 5 rounds beginning with the coarse grit followed by cleaning the bore and then repeating the firing and cleaning with each successively finer grit.

For used badly eroded barrels all grits are appropriate. New commercial barrels need only the three finest grits. For Custom or Semi-Custom lapped barrels with unpolished throats, only the two finest grits are appropriate. And for Custom or Semi-Custom lapped barrels with polished throats do not use these at all.

Hand loaders may purchase kits of bullets pre-coated with fine abrasives of several fine grits. Tubb's Final Finish (five grits) is offered in a limited range of calibers. NECO offers a kit for coating almost any caliber bullet (four grits), some pre-coated bullets, and even limited calibers of pre-coated bullets loaded as ammunition.

Manual Lapping/Polishing — a process using generally available materials, cleaning tools and “sweat – equity” to partially replicate the results and benefits of the barrel makers lapping process.

For detailed explanation of the process and required tools and materials see “Detail – Barrel Lapping/Polishing Process” starting on page 5.

This process has been very successful when used on new commercial barrels and neglected and/or eroded used barrels. However, it requires care and attention to the details. Therefore it is suggested that:

- for a single new or used rifle, seek out someone experienced in and equipped for doing the process to do that rifle
- if you wish to do multiple rifles your self, seek out someone experienced in and equipped for doing the process to guide and train you, also begin if possible on used rifles
- for Semi-custom – with lapped barrels but no polishing, throat polishing should be done only by an experienced practitioner
- for Semi-custom – with lapped barrels and polished chamber-throat-crown, this process is not appropriate for new barrels

## **CAUTION – DISCLAIMER**

The suggestions and recommendations herein are the opinions of the author based upon his own experience and supported by the experience of others who have also tried these methods. However, the author claims no special knowledge or expertise and assumes no responsibility for the consequences of anyone using these suggestions or recommendations.

The author has no affiliation with any of the suppliers of the materials listed in the Tools & Material List in the following section. Nor does the author receive any remuneration from the suppliers or dealers thereof for suggesting or recommending their products.

There may be other materials as or even more suitable to the purpose than those suggested and recommended herein. However, those in the Tools & Material List have been used successfully by both the author and others over many trials. Where material selection is not believed to be critical to results by the author, the item description bears an “(or equivalent)” notation.

The following process uses compounds that contain fine grit abrasives. Be cautious in their use. Variations in the process can and have been made but take care not to over-use these abrasive compounds. Also be careful to protect areas such as bolt recesses and trigger mechanisms and remove any abrasive compound or residue from them when finished.

# Detail – Barrel Lapping/Polishing Process

## Tools & Material List:

Ref #	Description
1	Cleaning Rod, 40" or 44", carbon fiber – correct caliber
2	Cleaning Brush, Nylon Bristle – correct caliber
3	Cleaning Jag, brass – correct caliber
4	Cleaning Patches, 50 suggested – correct caliber
5	Cleaning Brush, Nylon Bristle – next smaller caliber
6	Cleaning Patches, 10 pieces – oversized (wrapped on 4 is snug in barrel)
7	J-B Non-Embedding Bore Cleaning Compound (blue label)
8	J-B Bore Bright (red label)
9	Iosso Bore Cleaner (white tube)
10	Hoppe's Elite Gun Cleaner or Bore Gel (or equivalent)
11	Wipe-Out Brushless Bore Cleaner, Foam Type (or equivalent)
12	Wipe-Out Accelerator, Optional (used before 11 to speed action)
13	Bore Guide, Optional (use to protect action)
14	Cleaning Rod Stop, Optional (use to prevent lap from damaging crown)
15	Cleaning Rag, Optional (post process cleanup)
16	Gun Vise – must be sturdy (clamp to work surface if possible)

## Work Area Preparation:

Prepare a well lighted and ventilated work area with protection from cleaning chemicals (will stain porous surfaces and clothing). Place rifle in cleaning position on gun vise (item 16) and clamp both in place (force on cleaning rod both ways will be required).

## **Initial Cleaning:**

### **Used Rifles**

1. Inspect bore, if copper residue or burnt powder fouling is present (assume it is if you can't inspect), start by cleaning using foam type cleaner (items 11&12) as specified on product container.
2. Insert Bore Guide (item 13) or otherwise protect action.
3. Clean the bore normally: run a patch (item 4) wetted lightly with cleaner (item 10) on jag (Item 3) mounted on rod (item 1) thru the bore; repeat with dry patches 3 times.

### **New Rifles**

1. Insert Bore Guide (item 13) or otherwise protect action.
2. Clean the bore normally: run a patch (item 4) wetted lightly with cleaner (item 10) on jag (Item 3) mounted on rod (item 1) thru the bore; repeat with dry patches 3 times.

## **Lapping 1<sup>st</sup> Stage**

1. Assemble lap: put rod stop (item14)on rod (item1); put undersized brush (item 5) on rod (item1); wrap oversized patch (item 6) on brush (item 5) so as to be a snug fit in the bore; adjust rod stop (if used) or mark the rod so that the patch can be re strained from crossing the crown excessively.
2. Insert Bore Guide (item 13) or otherwise protect action.
3. Apply coarse abrasive compound (item 7) to the lap patch to coat the surface and lightly work it into fabric surface.
4. Alternately push and pull the lap through the bore for a total of 20 strokes in each direction taking care not to push the lap past the crown or pull it out of the throat until the last pull stroke.

## **Clean Bore 1**

1. Insert Bore Guide (item 13) or otherwise protect action.
2. Clean the bore normally: run a patch (item 4) wetted lightly with cleaner (item 10) on jag (Item 3) mounted on rod (item 1) thru the bore; repeat with dry patches 3 times.

## **Lapping 2<sup>nd</sup> Stage**

1. Assemble lap: put rod stop (item14)on rod (item1); put undersized brush (item 5) on rod (item1); wrap oversized patch (item 6) on brush (item 5) so as to be a snug fit in the bore; adjust rod stop (if used) or mark the rod so that the patch can be re strained from crossing the crown excessively.
2. Insert Bore Guide (item 13) or otherwise protect action.
3. Apply fine abrasive compound (item 8) to the lap patch to coat the surface and lightly work it into fabric surface.
4. Alternately push and pull the lap through the bore for a total of 20 strokes in each direction taking care not to push the lap past the crown or pull it out of the throat until the last pull stroke.

## **Clean Bore 2**

1. Insert Bore Guide (item 13) or otherwise protect action.
2. Clean the bore normally: run a patch (item 4) wetted lightly with cleaner (item 10) on jag (Item 3) mounted on rod (item 1) thru the bore; repeat with dry patches 3 times.

## **Lapping 3<sup>rd</sup> Stage**

1. Assemble lap: put rod stop (item14)on rod (item1); put undersized brush (item 5) on rod (item1); wrap oversized patch (item 6) on brush (item 5) so as to be a snug fit in the bore; adjust rod stop (if used) or mark the rod so that the patch can be re strained from crossing the crown excessively.
2. Insert Bore Guide (item 13) or otherwise protect action.
3. Apply bore polishing paste (item 9) to the lap patch to coat the surface and lightly work it into fabric surface.
4. Alternately push and pull the lap through the bore for a total of 20 strokes in each direction taking care not to push the lap past the crown or pull it out of the throat until the last pull stroke.

## **Final Cleaning**

1. Insert Bore Guide (item 13) or otherwise protect action.
2. Clean the bore normally: run a patch (item 4) wetted lightly with cleaner (item 10) on jag (Item 3) mounted on rod (item 1) thru the bore; repeat with wetted patches 2 more times; repeat with dry patches 5 times.

The rifle barrel is now ready for use!

## Process Variants:

Note: for some calibers it will be necessary to use a normal brush (item 2) and normal patch (item 4) to get a snug fit in the bore when assembling the lap.

The basic process is typical for new commercial factory barrels or for reasonably cared for used barrels. Tested variants include:

1. For used barrels showing internal rust, use twice the strokes in all three lapping stages but make a new lap and recoat every ten strokes.
2. For high usage barrels (varmint hunters) (>1000 rounds/year) repeat the procedure annually but only do 10 strokes total for each stage.
3. For typical usage target shooters (<1000 rounds/year) repeat the procedure annually but only do 10 strokes total for stages 2 & 3 and omit stage 1 and clean 1

On a limited number of target and varmint barrels that showed throat erosion, when used with an illuminated borescope for inspections, very good consistency and accuracy have been restored by carefully doing the process on the throat only using a shorter rod and limiting the strokes to that number that yields improvement – do in groups of 10 strokes total for each stage, clean and inspect before starting another set of ten with fresh patch and compound.

Again, based upon very limited numbers of trials, aggressive (high stroke numbers) processing of badly corroded old military barrels has yielded results of at least bringing the rifle from nearly non-shooting to respectable shooting levels.

For both of the above cases, close borescope inspection of samples before and after processing also during subsequent shooting shows that the process removes shallow surface imperfections and smoothes the edges of deep pits, both of which reduce fouling and copper buildup. The transition zones from throat to lands also appeared to be more smooth and even after processing.

Not enough trials on pistol and revolver barrels with before and after inspection and performance data have been documented to support recommendations. However, all have been reportedly easier to clean and show less point of aim change from clean to fouled barrel status.