Tumbling

Guidelines for Polishing Rocks & Minerals in a Vibratory Tumbler

The following guidelines are what I have found useful for the Tagit 2.5 pound vibratory rock tumbler. However, these directions should work for other vibratory rock tumblers and for larger loads by adjusting the amounts of grit, water, and soap.

1. Fill the bowl about three quarters full with your desired rock or mineral. It is best to have small and large rocks in the tumbler (1/8" to 1"). If you do not have enough of the desired rock, add a filler such as plastic pellets, apache tears, agates, or any other non-porous rocks that are of the same or less hardness than your desired rock. Why the concern about hardness? If the filler is harder than the desired rock or mineral, then the harder material will polish leaving the desired material which is softer scratched but not polished as well. Secondly, the softer rock will be worn away faster and if that is your desired rock, then you will lose more of it than is necessary.

2. Add the amount of silicon carbide grit (SiC) needed (see Table below), the amount of water, place the lid on the bowl, and run the vibrator for a number of days, checking it every once in a while and adding more water as needed to keep a slurry. If no slurry occurs, which is the case when the grit quickly settles out from the water, then it will take much longer to grind down the rocks or minerals. Too thick of a slurry will result in little movement and little cutting action. Getting a proper slurry is an art more than a science.

3. When the rock is rounded to your satisfaction, remove it from the tumbler and wash the rock and the bowl thoroughly. A Plexiglas screen in a large funnel works well for this operation. The wash water and the used grit should not be put down any water drains, because the grit will clog the drain. Instead, wash the grit into a holding bucket, allow the sludge to settle, and then dispose of the water and the grit separately.

4. Return the rock to the tumbler, add one tablespoon of soap (Ivory Flakes work well), and fill the bowl with water to the top of the rocks. Vibrate this mixture for about half an hour. Again wash the rocks and the bowl, and repeat this washing step twice more.

5. Return the washed rocks to the bowl and proceed to step 2 with the next grit (see the Table below).

6. After the polish step, the last grit in the Table, is completed, wash the rocks with soap as in step 4 and dry.

For best results, a separate bowl should be used for each grit. Graded grits work best, but are more expensive than grits listed as coarse, medium, and fine.

All numbers in the Table are approximate and will vary with the tumbler, load, type of rocks used, and so on.

Note that TiO_2, titanium dioxide, is not listed as a polishing agent. While this material is cheap and does a good job of polishing gemstones, it also leaves a white fill in cracks and crevices, which is extremely hard to remove.

TABLE
SUGGESTED CONDITIONS FOR POLISHING VARIOUS ROCKS AND MINERALS IN A VIBRATORY TUMBLER

Grit/Compound		SiC	SiC	SiC	SiC	SnO2	CeO2	Diamond	Diamond
Mesh		220	400	600	1,000	---	---	14,000	50,000
Grit	Amount	8 tbls	4 tbls	4 tbls	3 tbls	4 tbls	4 tbls	1 cc	1 cc
Water	Cups	3/4	3/4	3/4	1/2	1/2	1/2	1/2	1/2
Soap	Tbls	0	0	0	0	1/3	1/3	1	1
Speed		fast	fast	fast	fast	slow	slow	slow	slow
Stone	Hardness	Days	Days	Days	Days	Days	Days	Days	Days
Sapphire	9	28	7	7	7	5	---	---	---
Emerald	8	3	3	4	2	4	---	---	---
Aquamarine	8	3	2	2	2	2	---	---	---
Topaz	7.5	3	2	2	2	2	---	---	---
Zircon *a*	7.5	8	3	2	2	2	---	---	---
Agate	7	7	4	2	3	---	3	---	---
Amethyst	7	5	3	3	3	3	---	---	---
Citrine	7	7	4	2	2	2	---	---	---
Chrysoprase	7	---	4	3	3	2	---	---	---
Peridot *b*	6.5	---	2	2	2	---	---	2	2
Opal *b*	6	---	---	1	2	2	---	---	---
Lapis lazuli *b*	5.5	---	4	3	3	2	---	---	---
Apache Tears *b*	5	---	3	2	1	1	---	---	---
Apatite *b*	5	---	2	1	1	---	---	1	1

a About half of the volume was polished agates.

b Slow speeds used on all steps.

SiC is silicon carbide; **SnO2** is tin oxide; **CeO2** is cerium oxide; **Diamond** is paste that is sold in a syringe; **tbls** is tablespoon; **cc** is cubic centimeter.

How do I proceed to use the rotary tumblers?

There is several 4-step media packages available to use with your tumbler. Each of the four steps requires one week to complete to complete the tumbling cycle.

You never pour any used media down the drain (it will turn to cement).

When you purchase your tumbler a book comes with the tumbler. This will explain how much media to use with the size tumbler that you purchased. For LORTONE tumblers turn to page 10.

You will find that pellets are mention in the book. They are used as a filler. If you do not have a complete load you may add the plastic pellets to complete the load. For polishing the pellets are used for a filler as well as a buffer to keep the rocks or slabs from hitting together and chipping. If you use pellets in the grinding cycles NEVER use the same pellets in the polish cycle.

NEW: **Something better than using pellets is to use ceramic. The ceramic comes in small and medium sizes. The cost is almost twice of that of the pellets, but well worth it. They do the same work as what pellets do but in addition they add that extra polish to your stones, also used in the polishing of brass cartridges. They last longer and are easier to retrieve after the polish cycle. Recommend there use mainly in the polishing cycle. For those of you that make spheres you would use one of the larger tumblers {12 lb tumbler}, and add some of the larger ceramic cylinders along with cerium {or other polish if you prefer}, and you will get that great polish on those hard to polish spheres. This saves time as well as the amount of polish that you use.**

Always clean your rock from all grit after each cycle.

TUMBLING COMPOUND QUANTITIES

TABLE I

3# BARREL **60/90; 4 Tbsp**	**120/220; 4 Tbsp**	**FINE; 5 Tbsp**	**Pre-Polish; 5 Tbsp**	**Polish; 5 Tbsp**
4.5# BARREL **60/90; 8 Tbsp**	**120/220; 8 Tbsp**	**FINE; 8 Tbsp**	**Pre-Polish; 8 Tbsp**	**Polish; 8 Tbsp**
6# BARREL **60/90; 10 Tbsp**	**120/220; 10 Tbsp**	**FINE; 10 Tbsp**	**Pre-Polish; 12 Tbsp**	**Polish; 12 Tbsp**
12# BARREL **60/90; 20 Tbsp**	**120/220; 20 Tbsp**	**FINE; 20 Tbsp**	**Pre-Polish; 24 Tbsp**	**Polish; 24 Tbsp**

Why doesn't my rock polish?

Not all rock will polish. If your rock looks like it is polished when it is wet, then you can figure that most of your rock will polish the same.

If you had some rock's with pits in them, they could have carried some grit to the polish cycle and this will keep your rocks from polishing. If you have a few rocks

that still have these pits in them, just remove the rocks and add them to the next load.

MATERIALS: Materials that appear different... Shiny as opposed to dull, Translucent as opposed to Opaque, or Opaque with color and or a pattern. If stones are wet when picked up, but turn dull and dry almost immediately, chances of polishing are slim. These could be decorative, but not tumbling materials. If collecting in a dry area, take along a spray bottle filled with water. Pre-select tumbling materials, spraying to determine whether you have a collectable stone. The large sized material will have to be reduced by crushing or breaking.

When is the best polish ?

The Best Polish

Q. What is the "BEST POLISH"

A. There is not one polish that is best for everything.

Pro-Polish is a polish that if you have not tried you should Pro-Polish polishes much like Tin Oxide, but at half the price. This 1/2micron range fine grade alumna polish works on most materials, including many problem stones.

Tin Oxide can help you put that super polish on Opal and many Quartz family stones.

Most Quartz type stones and Glass polish very well with our Optical Grade Cerium Oxide. For a more brilliant finish, you may want to try Super Cerium (also known as French Cerium), our ultra high purity Cerium Oxide (it's white!).

Lapis, Jade, and Rhodonite polish very well with Chrome Oxide (yes we know it is a messy Green, but it does the job on these hard to polish stones). Chrome Oxide also works well on Quartz.

Sapphire Powder is the equal in every way to the old Linde A and B. Used mainly for faceting, it is also becoming a standard for polishing cabs by many professional cutters.

CPP is designed for use in a rotary tumbler. CPP works on most stones, soft or hard. CPP is very low priced!

For what do to tumble brass or Apache Tears....?

VIKING K-G CARRIER

FOR LOAD CUSHIONING AND METAL BRIGHTNESS- Ideal for the ammo re-loader for burnishing brass casings. Can also be used for al stages in stone tumbling, except rough grind, to cushion the tumbler load when using the wet method. Ideal for Apache Tears. Can be used dry after polishing to burnish to the perfect finish.

Also the use of CERAMIC CYLINDERS will greatly enhance your polishing of rock and or brass casings.

Grits for Tumbling

Q. What grits should I use for rocks in my tumbler?
A. For most stones in a barrel (rotary) tumbler, we recommend a four step process. Coarse grinding is done with 60/90. Medium grinding uses 120/220. The fine grind works well with 500F. CPP polish does the job on most stones, hard or soft. The "split" grits, 60/90 etc., work as well as the more expensive straight graded grits for most tumbling. A great way to get this series is with our 4 STEP GRIT KIT. It comes packed in four re-closeable plastic jars proportioned to grind and polish 10 - 14lbs of rock.

TUMBLING

PROCEDURES

If you haven't tumbled stones before,
or need a refresher,
these procedures may be of interest to you:

PREPARATION

1. **Wash** the stones thoroughly. Be sure there is no debris attached to the stones. Use a brush and soapy water if necessary.

2. **Sort** your stones by size and hardness into groups or batches. Soft stones will grind away before hard stones are ready for the next step. Stones of nearly the same size will have more points

of contact and therefore will produce a more thorough and faster grinding action. If certain shapes or sizes are desired, you may want to preform your stones by grinding them on a lap first.

COARSE GRIND

3. The amount of stones put in a tumbler barrel depends on the size of the barrel and the stones themselves. The best tumbling action occurs when the barrel is filled **50% to 60%** of its capacity. Fill the barrel with your stones to 1/2" above the half-way mark. Remove the stones and weight them. This weight will help you to determine how much grit is needed. Record this weight for future reference. Use the following ratio to determine the amount of silicon carbide grit needed for your batch:

   One pound of grit per eight to ten pounds of rock.

   Put your batch of rocks back into the barrel and **add grit** accordingly. If the rocks are chips or have rough crude surfaces, start with a **coarse grit (60/90 mesh)**. If the rocks are water worn from tumbling in stream beds or already tumbled by ocean waves, start with a medium grit.

4. If **baking soda** is available, add about a **tablespoonful** to the mix. The soda will help **neutralize the gases** that might be formed. Add water into the barrel so it is either just touching the bottom of the top layer of rocks or until it covers the rock by no more than **1/16 of an inch**. Put the cover on and secure it. Place the barrel into position on the tumbler.

5. Put the tumbler into operation and observe its action for a few minutes. Check for loose or slipping belts or pulleys. **Listen to the sounds** coming from within the barrel. Is there sufficient amount of action taking place? If there isn't, shut down the operation, open the barrel and **inspect** the consistency of the mixture. If the mixture is too dry, add a little water. Put the cover back on and continue as before. If everything appears to be functioning properly, you can leave and come back periodically to check the operation.

6. It will take an average of **four to six days** of coarse grinding. **Sharp-edged** or broken pieces of agate may require as much as **360 hours** of coarse grind operation. After each 24 hours of

operation, shut down the operation. Remove some stones from the barrel and examine them. You can add or decrease the grinding time according to how much more rough grinding you want performed. If you want to continue with the coarse grit, inspect the grit and the consistency of the mixture. If the grit no longer has sharp edges, you may want to add more coarse grit. If the mixture is too dry, you may want to add a little more water. Place the stones back into the container, seal the barrel, place it into position, and start up the operation. Observe and listen to see if the operation is functioning properly. You can leave and check back periodically. When the coarse grinding phase is finished to your satisfaction, you can proceed to the next step. If a few stones need more coarse grinding, you can remove them from this batch and re-tumble them later in another batch.

7. Remove all of the material and stones from the barrel and place in a pan. DO NOT use an **aluminum** pan. It may **discolor your stones**. **Plastic is preferred**. DO NOT wash the waste material down your drains. It may harden in the traps or pipes and require major plumbing repairs to clear the pipes. Clean the stones, the barrel, the lid, the pan and any other part that has made contact with the grit mixture. Wash everything and your hands thoroughly. You do not want any previous grit particle left to contaminate the next mixture. It may produce scratches.

MEDIUM GRIND

8. Place the stones back into the barrel. If they do not fill the barrel to the half-way mark, you may need some **filler material**. The filler material is available from lapidary supply stores. **Inexpensive marbles**, **plastic pellets**, or **crushed walnut shells** make good substitutes. Add the filler material until the half-way mark is reached. Add about one tablespoonful of **baking soda**. Add **220 or "240 & finer" grit** to the mixture in the same quantity as the coarse grit. Add water into the barrel so it is either just touching the bottom of the top layer of rocks or until it covers the rock by no more than **1/16 of an inch**. Put the cover on and secure it. Place the barrel into position on the tumbler.

9. Put the tumbler into operation and observe its action for a few minutes. Check for loose or slipping belts or pulleys. **Listen to the sounds** coming from within the barrel. Is there sufficient amount of action taking place? If there isn't, shut down the operation, open the barrel and inspect the consistency of the mixture. If the mixture is too dry, add a little water. Put the cover back on and continue as before. If everything appears to be functioning properly, you can leave and come back periodically to check the operation.

10. It will take an average of about **four days**, or **96 to 100 hours**. After **each 24 hours** of operation, shut down the operation. Remove some stones from the barrel and **examine** them. You can add or decrease the grinding time according to how much more grinding you want performed. If you want to continue, inspect the grit and the consistency of the mixture. If the grit no longer has sharp edges, you may want to add more grit. If the mixture is too dry, you may want to add a little more water. Place the stones back into the container, seal the barrel, place it into position, and start up the operation. Observe and listen to see if the operation is functioning properly. You can leave and check back periodically. When this grinding phase is finished to your satisfaction, you can proceed to the next step. If a few stones need more grinding, you can remove them from this batch and re-tumble them later in another batch.

11. Remove all of the material and stones from the barrel and repeat the **cleaning** procedures used after the coarse grit operation. Clean the stones, the barrel, the lid, the pan and any other part that has made contact with the grit mixture. Wash everything and your hands thoroughly. You do not want any previous grit particle left to contaminate the next mixture. It may produce scratches.

FINE GRIND

12. Extreme care should be taken from this point on to prevent the stones from chipping or breaking. Place some water in the barrel first and then place the stones gently into the barrel. If they do not fill the barrel to the half-way mark, you may need some filler material. Don't use contaminated filler material from previous operation. Add the filler material until the half-way mark is achieved. Add about one tablespoonful of **baking soda**. Add **500, 600, or "600 & finer" grit** to the

mixture in the same quantity as the coarse grit. Add water into the barrel so it is either just touching the bottom of the top layer of rocks or until it covers the rock by no more than 1/16 of an inch. Put the cover on and secure it. Place the barrel into position on the tumbler.

13. Put the tumbler into operation and observe its action for a few minutes. Check for loose or slipping belts or pulleys. Listen to the sounds coming from within the barrel. If there isn't sufficient action taking place, shut down the operation, open the barrel and inspect the consistency of the mixture. If the mixture is too dry, add a little water. Put the cover back on and continue as before. If everything appears to be functioning properly, you can leave and come back periodically to check the operation.

14. It will take about **72 to 150 hours** for the stones to be ready for the polish phase. After each **24 hours** of operation, shut down the operation. Remove some stones from the barrel and **examine** them. You can add or decrease the grinding time according to how much more grinding you want performed. If you want to continue, inspect the consistency of the mixture. If the mixture is too dry, you may want to add a little more water. DO NOT add more grit. Place the stones back into the container, seal the barrel, place it into position, and start up the operation. **Observe and listen** to see if the operation is functioning properly. You can leave and check back periodically. When this grinding phase is finished to your satisfaction, you can proceed to the next step.

15. Continue to take **extreme care** not to damage the stones. Remove all of the material and stones from the barrel and repeat the cleaning procedures used after the coarse grit operation. Clean the stones, the barrel, the lid, the pan, the sink faucets, etc. **Wash everything and your hands** thoroughly. You do not want any previous grit particle left to **contaminate** the next mixture. It may produce scratches.

POLISH

16. Allow the stones to **dry** and then **examine** them very carefully. **Remove** any stone that is **chipped, broken**, or has very sharp edges. The damaged stones will scratch the rest of the batch if left to remain. Place the stones gently into the barrel. If they do not fill the barrel to the half-way mark, you may need some

filler material. Filler materials such as **sawdust**, **wood shavings**, **cornmeal**, **walnut shells**, and **rubber strips** (cut-up rubber bands) are ideal. They will help prevent damage to the stones by absorbing some of the tumbling (banging) action. Add the filler material until the half-way mark is achieved. Add about one teaspoon of **detergent** soap. The best type to use, is a "**sterile**" form such as **Ivory Snow** powder, as most other detergents have additives such as **chlorine** which could **chemically react** with the stones as they are being polished. Using a pure soap is better. Add **cerium or tin oxide** to the mixture in half the quantity as the coarse grit. Add water into the barrel so it is either just touching the bottom of the top layer of rocks or until it covers the rock by no more than **1/16** of an inch. Put the cover on and secure it. Place the barrel into position on the tumbler.

17. If it's possible with your unit, **reduce the speed** of rotation by about **twenty percent**. Put the tumbler into operation and observe its action for a few minutes. Check for loose or slipping belts or pulleys. **Listen** to the sounds coming from within the barrel. If there isn't sufficient action taking place, shut down the operation, open the barrel and inspect the consistency of the mixture. If the mixture is too dry, add a little water. Put the cover back on and continue as before. If everything appears to be functioning properly, you can leave and come back periodically to check the operation.

18. It will take about **48 to 150 hours** for the stones to be completely polished. After **each 24 hours** of operation, shut down the operation. Remove some stones from the barrel, **wash and examine** them. If they become duller as they dry, then they are not completely polished. Carefully put them back into the barrel and polish them for another 24 hours. Inspect the consistency of the mixture. If the mixture is too dry, you may want to add a little more water. Seal the barrel, place it into position, and start up the operation. **Observe and listen** to see if the operation is functioning properly. You can leave and check back periodically.

FINAL CLEAN-UP

19. When you are **satisfied** with the polish results, Remove all of the material and the stones from the barrel and repeat the

cleaning procedures used after the coarse grit operation. **Clean** the stones, the barrel, the lid, the pan, the sink faucets, etc. Wash everything and your hands thoroughly. Carefully place the stones back into the barrel. Add enough **detergent** soap powder and water to make a thick soapy solution. Tumble the stones for **6 to 12 hours**. Remove the stones from the barrel carefully and place them in a **plastic colander**. Wash them thoroughly. Spread them on a cloth or towel to dry. Those that are properly polished will have the same appearance as when they were wet. If some stones are not satisfactory, you can re-run them later with another batch as fillers.

TID-BITS

You may want to add **fine granular sugar** or **sugar paste/slurry** to your pre-polish and polish stages. Sugar makes the slurry very thick. This cushions the rocks as they tumble. Add twice as much sugar as pre-polish/polish to make the polishing slurry thick but not dry.

The actual amount of grit and polish depends on what you are wanting to shape and polish, size and amount. **Vibratory tumblers** use less grit and polish than rotary type. Normally, **rotary tumblers** use an **8:1** to **10:1** ratio of rock to grit and **16:1** to **20:1** ratio of rock to polishing powder. The idea is to use the least amount that would provide the most effective use giving the best results. Experiment and keep records.

There are **"Media Kits"** designed for deburing and finishing metal castings and stampings in vibratory tumblers. First two steps of the kits process uses plastic media embedded with silicon abrasive of different mesh grit, while the last step utilizes a dry polish. This process deburs and produces a high luster on a number of metals without problems of impact damage.

Always **take notes**. **Record your procedures**, any changes made, the time you start and stop an operation, and how long each operation takes for the type of material you are tumbling. Don't be afraid to **experiment**.

Quick Start (Rotary Tumbling)

If you just obtained a rotary (not vibratory) tumbler and want to get started as fast as possible, read this section and go play.

- **Fill the barrel 2/3 to 3/4 full** of rocks. All the rocks should be small enough to tumble without getting wedged in the barrel. For best immediate gratification use hard, solid, silicified rocks like agate or jasper (including most fossil wood), and don't mix in softer rocks like calcite, quartz (hard material but it "frosts"), or feldspar.
- **Add coarse silicon carbide grit** (described such as "30", "60/90", etc, for the grain size). I use 4 tablespoons (volume) for a 3-pound Lortone barrel, and 8 ounces (1 cup) for a 12-pound Lortone barrel.
- **Add water**, enough to nearly cover the rocks. Ensure the lip on the barrel is clean.
- **Seal the lid** per the manufacturer's directions and start tumbling. Ensure the lid is on tightly and evenly. Wait one week. Keep an ear on the tumbler occasionally and glance at it once or twice a day. If you are away from home for more than a day, turn off the tumbler while you're gone and resume when you get back. (I keep paper handy to log the start date, etc.)

  Notes:

  - Rock tumbling makes a little **noise**. Put the tumbler someplace where the noise is hidden or at least muffled to a nice waterfall sound you can enjoy rather than hate. Also pick a place that's not cold enough to freeze the contents of the barrel, as cool as possible to be nice to the motor, not too dusty, dirty, or wet, and safe from bugs, kids, and pets.
  - If you **underfill** the barrel it sounds noisier. If you **overfill** it, it makes a lot less noise and the tumbling doesn't work well. You'll figure this out pretty fast with experience.
  - Many instruction manuals say to **check the rocks** more frequently than weekly. This is messy and really unnecessary. My experiments say only a trace of coarse grit remains after 5-6 days, and none after 7 days.
  - Many instruction manuals say to **burp** the barrel periodically. This is also unnecessary, the only exception in my experience being bottle glass, it does "outgas" and expand the barrel. All other materials I have ever tumbled seem to dissolve some of the gas, rock, or grit, such that the barrel ends actually suck in during the week. Just keep an eye on the bottom end of the barrel for bulging out (bad) or sucking in (not a problem).
  - **Timing is not critical** with rotary tumblers. You can mess with them a day early, or let them run several days late if you get too busy to mess with them.
- **Open barrel**, wash **thoroughly**: Lid, barrel, rocks. Do **not** pour the slurry down the drain, it will clog your pipes. The simplest method is to catch it in a bucket (ask for free "bakery buckets" at a supermarket), let it settle, and pour off the nearly clear water. Gather dense slurry until you have enough, set it aside to dry thoroughly, and trash the resulting "mud brick".

I scrub the edge of the lid and the lip of the barrel with an old toothbrush. I also make sure to get all the slurry and grit out of holes and crevices in the rocks when going to a finer grit.

- **Study the rocks**. Are they smooth enough to make you happy? If not, repeat another week with coarse grit. Otherwise go on to fine grit. It can take 1-4 weeks of coarse grinding depending on how smooth your rocks are to start with and how rounded you want them to be when polished. (I like my rocks well-rounded...)

  Note, I have enough rocks in the process that every time I dump the barrel from a coarse load, I sort the rocks into at least three classes:

  1. Ready to polish.
  2. Needs more coarse grinding.
  3. Junk, throw it away.

  But especially if you are tumbling all identical rocks it's fine to never sort them, and just repeat coarse grinding the whole load one week at a time until you think they're mostly ready to polish. In this case, start with the barrel kind of over-full because the rocks "shrink", mostly during coarse grinding, and you need enough to work well in the later stages.

- **Finish polishing**. When you have a "full" load of rocks ready to polish, run them a week with fine silicon carbide grit (like "220"). Then run them a week with "pre-polish compound" (a coarse metal oxide powder), and finally a week with "polish compound". For the latter I prefer cerium oxide, but tin oxide is good too. I find alumina (aluminum oxide) doesn't work well.

  Note well, you must dump the slurry from the coarse and fine runs, but you can reuse -- a lot -- the more expensive prepolish and polish compounds, as described elsewhere.

- **How'd it go?** If you wash and dry rocks from the final polish step and they are not shiny enough to please you, there are several possibilities:
  - **Wrong kind of rocks**. Some rocks are just too soft or irregular, or tend to end up "frosted". It's still fun to experiment. If at least one of your rocks in a load is nice and shiny while others are not, probably the others won't take a shine, or at least need special handling.
  - **Need more polish time**. Try running them several more days, or even another week, with polish compound. Another trick I use is to just get "lazy" and let the polish runs go a bit long on purpose, like 8-9 days.
  - **Contamination**. Are you sure you got the rocks and the barrel and lid totally clean between steps? Traces of coarser grit can mess you up.
  - **Broken edges**. Sometimes a crack in a rock will break apart late in the game, and the new, rough edges mess up other rocks in the load. This is disappointing but easy to fix with more tumbling time.
- **Remember to lubricate** (oil) your tumbler as the manufacturer recommends. On my 3-pound unit I oil the shafts once a month with 10W30 motor oil from an eye dropper bottle, and the motor only rarely when it squeaks, as described

elsewhere. On my 12-pound unit I oil the shafts about every two weeks and the motor about every three months.

How much stuff?

How much rock with how much grit and how much water for how long?

It depends on the barrel size. As a rule, fill the barrel 2/3 to 3/4 full of rocks. Any less and you get sliding or smashing instead of tumbling. Any more and you don't get enough motion to do the job or consume the grit. After a while you can tell from the sound. It should be loud but not violent, like a waterfall. Play with it.

Rock size matters too. You need at least half the load to be smaller pieces. You **can** work larger chunks too... The booklets say no bigger than 3/4", but I've had OK results with up to 3-4" across (in the 12 lb tumbler). Naturally as you get to bigger pieces the tumbling action can be less regular or more violent.

Note that the coarser and harder the rocks starts, the longer it will take to be ready to move to fine grit, and the more "evaporation" you get. Each coarse dump and reload is a big remixing of rocks, taking out "done" stuff and adding more "raw" stuff to bring it back up to 3/4 full. With softer rocks, "evaporation" is a problem even after the fine step, so I start with it a little fuller, and sometimes I add more rock (which is sitting around in a box ready to go into fine, prepolish, or polish) to make up a full load.

The booklets says to use 4-6 tablespoons of grit for a 2.5 lb tumbler load, and a full cup for a 12 lb tumbler. I tend to be frugal; the worst that happens is not enough grinding or polishing, and you send the rocks back for some more (another week).

Fill water to touching the bottoms of the top rocks in the barrel.

To be safe, I run each load a week -- or longer if I don't get around to doing a tumbler dump when it's due. You can tell you're tumbling long enough if there's no visible or palpable grit, just fine sludge, when you dump a coarse load.

I gather that bigger barrels give better tumbling?

No, just more capacity and (in my experience) you can polish bigger rocks. If anything the bigger ones are more of a risk for consuming grit faster (can be more of a waste if you do something wrong) and for beating up rocks that don't like to be tumbled (because the fall distance on each rotation is further).

Do you really need grit?

In the natural world you can observe that rocks are often rounded by water action, and nearly polished in some cases. This happens mostly in rivers and streams when water flow is high enough to move the rocks, and/or when the water carries a lot of suspended sand or finer particles. It also happens when waves break on a lakeshore or seashore. Using grinding and polishing grit in a tumbler is more of an accelerator than a necessity. But it's a great accelerator.

In theory you could load a tumbler with rocks and water -- maybe even leave out the water -- and let it run unattended for weeks or months, then open it to find nicely polished rocks. In practice, though, in the closed environment of a tumbler, I would expect the slurry (mud) or dust to build up to a point where grinding and polishing action nearly ceased. Furthermore, the grit or polish compounds are harder than most rocks and cause them to smooth and polish a lot faster than merely going rock-on-rock with without grit or polish compound.

After a long time I finally tried this experiment myself in my tire tumbler (described later). Sure enough, while slurry did form and the rocks did round off a little, it was only 20-25% as fast as with grit.

Buying grit:

Tumbling grit is available in a wide variety of sizes, types, and prices. For volume work, say with 12 lb or larger tumbers, it's worth locating an industrial supply house and buying 50 lb or 100 lb boxes of coarse and fine grit for about $1.50/lb (or higher); otherwise expect $2-3/lb in smaller quantities at lapidary, hobby, and similar shops, sometimes even more. It might hurt to spend so much up front, but remember that the net cost still works out to about just $1 worth of grit (all grades) per pound of finished rocks -- it's a cheap hobby.

By shopping around I am usually able to buy silicon carbide grit (coarse or fine) in 50-pound or 100-pound units, on sale for about $1.50/pound delivered to my doorstep (typically by UPS, in the United States).

Handling grit:

When you buy grit in bulk, you might dole it out directly from the shipping container, or if that's inconvenient, repackage it into a 5 gallon bucket with a lid.

Another possibility is to spread out a plastic dropcloth and decant the grit through a funnel into clean, dry, 2-liter pop bottles. The result is quite manageable... The bottles are tidy, visible, easy to pour, and weigh about 8 lbs each.

I carefully measured grit by the tablespoon into a cheap plastic cup and observed that 20 tbsp just filled it. Now the cup is a handy measure for loading my 12 lb tumbler. Also I measured 4 tbsp into the same cup and marked the outside so I can use it for the 3 lb tumbler too.

Disposing of slurry:

Expanding on what I wrote earlier about not pouring slurry down the drain...

From my big truck tire tumbler I get a lot of slurry. (I call it "slurry in a hurry.") I fill a five-gallon bucket with gray "mud" (slime) and a little muddy water about every month or two and then float-filter off the water as much as I can. The float filter is a cheap freestanding strainer with the outside covered with old denim fabric literally stitched onto it. I float it in the bucket, usually adding a rock for a little more weight,

and about twice a day sponge out the clear water that collects, until there's no more. Then the bucket goes outside.

In winter I turn over the bucket onto a plastic tarp after it freezes, and the next warm day I get to take the bucket off a frozen slurry block that can then dry out as weather permits. In summer I set the mostly dewatered slurry bucket out in the sun to finish drying. I let the slurry get rather dry, turn over the bucket the same way, wait again a day or two, and remove the bucket. In both cases if there's much crud stuck to the bottom of the bucket, I let it dry out a while longer, whack and shake, until it's cleaned out enough.

November 2005: After busting one bucket in the winter when the slurry froze, I had a better idea. I dug a hole in the side yard, and from now on I'll pour the slurry in there to dry or freeze before busting it up to dispose of in the trash. So far, works great.

The dried slurry block is not as hard as concrete, but it does have cohesion. If I wait until it dries completely, I have to whack it pretty hard with a shovel to bust it up so I can get about half at a time into the trash (so the pail's not too heavy).

When slurry hardens on a surface, it can get resistant to being hosed off. The key is to avoid letting the slurry dry before you're ready, and to avoid letting it settle (even if it stays wet) anyplace you can't reach to clean, like inside your plumbing. When I dump the tire tumbler, I try to get the tub of rocks and slurry into the sink and rinsed off without undue delay. If it dries for even a couple of minutes (here in dry Colorado), some of the rocks get a sticky grey coating that won't spray off later, so I must rub it off each rock as I sort them.

I've noticed something very interesting about my slurry. Sometimes when I'm scooping it out of the spooge bucket it sticks together in a really bizarre way, as if it were soft Silly Putty. I suspect that trace amounts of organics from lichen on the rocks cause this effect. It's weird stuff, hard to extract into the drying bucket.

Reusing prepolish and polish compounds:

The late owner of Dick's Rock Shop in Estes Park, Colorado did me a huge favor years ago when I was up there buying polish compounds from him. He clued me that I could reuse the relatively expensive prepolish and polish oxides (typically $3-12/pound). He was right, with care the same batch is useful for **years**.

The trick is to catch the slurry in a clean container without contaminating it. Use the minimum amount of water to wash as much of it as possible off the rocks. I suspend a heavy duty round plastic collander in a 1.5 gallon plastic mixing bowl, both obtained cheap at a "dollar store". After rinsing the barrel over the rocks, I hold the collander up over the bowl and rinse a bit more water through it while circulating the rocks a little. Usually I'm able to separate and capture the slurry from a 12-pound tumbler load with less than one gallon of total fluid resulting. But sometimes you dilute it more. Over time I've ended up with three one-gallon bottles for each type (prepolish and polish).



Pour the prepolish or polish fluid through a clean funnel into a plastic gallon jug designated and marked for that material. (I marked the lids "PRE" and "POL".) Let the bottle settle until you need it again, usually weeks later. At that time, carefully pour off the mostly clear water until lumps of slurry appear, then stop. Be careful not to shake up the bottle while doing this. After separating as much nearly clear water as you can from the reused slurry, cap the bottle, shake up the remainder, and pour the (hopefully soupy-thick) slurry into a tumbler load of new stones ready for prepolish or polish.

Note that you don't dry out the slurry, you just let gravity condense it back to a suitable density.

Over time you lose some of the polish compound, even as the slurry grows in volume due to rock dust. You can add a bit of fresh compound to the mix as needed to freshen it. Eventually, though, it ceases to polish well. Then it's time to dump both the prepolish and polish bottles, just like coarse and fine slurry, and start over.

Separating types of rocks:

Professional rock tumblers say you should never mix different types of rocks in a load. I find this hard to do, and not that important anyway. Some rocks, like petrified wood, naturally vary in hardness between pieces, or even across a single piece. Also, not even I operate on batches large enough to take one type of stone all the way from coarse grinding to polishing. This is particularly true since rocks "evaporate" during coarse grinding -- a load of stones that starts out filling a tumbler on coarse grinding has not enough volume when you get to final polish, if you try to just take one load all the way through.

I don't worry about mixing rock types during coarse grinding. Everything goes in my big tumbler with the 31-inch tire for a barrel. (Note, here is a newer version of the door design drawing.)

(One photo nearby shows the revised door design as of November 2003, including a screw-eye I added to the edge of the door after drawing up the revised design (grin) to make it easier to pull it off the "slurry glue" when opening it. This picture shows what it looks like when the door seal or the rim seal leaks a little! Also note the supports I had to add after all to keep the tire upright. You can't see the rollerskate and rollerblade wheels between the supports and the tire.

Another photo nearby is a side view.

A third photo nearby, taken without a flash, shows the tumbler in motion.)

After dumping each coarse load I sort the rocks by type: Hard and ready to polish, soft and ready to polish, not yet ready to polish, and junk to throw away. "Soft" means anything that needs buffering (pellets), including quartz, feldspar, calcite, etc. The sorting takes time, but it's relaxing and I enjoy it.

There are a few exceptions. I don't mix hematite with anything else because of the incredibly messy blood-red slurry hematite produces. (Sometimes I get a surprise

when I tumble or hand-grind a rock that doesn't look red or metallic because the slurry from it is distinctively red (rusty). To me that just means there's a lot of iron in the rock.) Very soft material does not go in my big tumbler, instead I coarse grind it in a smaller one. Also agate slabs that were never polished, or which have broken, don't survive coarse grinding well in my big tumbler, so they go in a small one.

When filling a barrel for a "fine" run from my "hard, ready to polish" or "soft, ready to polish" buckets, I overfill the barrel a little, then that load goes through fine, prepolish, and polish runs without adding or subtracting rocks. For "soft" runs I leave room and add plastic pellets.

Buffering agents:

Softer stones like calcite, and some harder stones like quartz, do not take a good polish in a tumbler because their surface erodes or chips too fast. These materials need a buffering agent to cushion them. Apache tears (obsidian) are particularly hard to shine. Buffering agents range all over the map from sugar solutions to walnut shells to bits of leather.

I have gotten a very nice shine on quartz; also on monocrystal pink feldspar, but being a soft stone, it needs a buffering agent during prepolish and polish, or else it "mattes". Bear in mind that amazonite, moonstone, and many other types of stones are actually feldspars.

I suppose you could also turn down the tumbler speed -- but this is hard to do on commercial rotaries, and dysfunctional on vibratories even if you could? They must shake to function.

My favorite buffer is plastic pellets. These are not cheap, maybe $2-4/pound, but very reusable. It's more of a pain to deal with them than just grit, but you can float them off the rocks and slurry after dumping the barrel into a big enough bucket, and catch them in a strainer. Rinse the pellets well, shake the water off them as much as possible, and dump them into an open container for a while until the water evaporates and the pellets no longer stick together, then store them in a sealed container to keep them clean.

I store and use two "grades" of pellets: Some only go with fine grit, and the others with prepolish and polish. The "fine" pellets turn black and slowly wear away. The "polish" pellets I simply wash thoroughly when going from prepolish to polish compounds, and then I reuse them on the polish run.

I have found that if you run two tablespoons of Tide (flake style) (per 12 lb tumbler) in between the different grits it will clean them nicely and takes off a lot of excess grit that is left on the stones... Even when you think you have it all off. I also use rubber bands in all of my tumbling as a cushion. Easier to clean and to remove from the stones.

Some say that to get a very high gloss shine you should "burnish" your stones by running them beyond final polish with a soap solution. I never bothered to try this. I guess I'm happy enough with what comes out of a polish run.

Later I did try it once, using Boraxo as the "soap". The stones didn't look any shinier, but little bits of black material came out with the load (oops). I wouldn't try that chemical again.

In 1996 Roger Pabian wrote (and I edited),

I have had excellent results using Palmolive dish washing detergent (for hand dish washing, not automatic dishwashers). About 2 tablespoons or 1/4 cup does an excellent job in about a week's time where agate, jasper, and petrified wood are concerned. The above measure applies to a small tumbler of 6 to 8 pound capacity.

I have utilized Spic and Span and liquid Tide, but find the Palmolive to be about the easiest to use, and easy on hands too. All you use is the detergent, no other compounds, and no water.

I have used this method for about 10 years.

Some Rocks Won't Polish:

Many rocks grind fast but won't polish. Sandstone might be an extreme example. Gneiss and schist, even calcite, similarly, are too irregular or soft. Quartz, feldspar, quartzite, maybe others, can tumble-shine but only with pellets after the coarse grind, or else they frost.

If I like the shape of a rock and how it looks wet, even if it won't shine, I spray it with cheap, clear acrylic enamel, and that comes out nice too. The finish won't stand up to water or sunlight, but it's very durable indoors and doesn't mind human handling.

Polished pebbles:

Coarse grinding naturally produces a lot of small rock chips, especially from my big tumbler. Sorting the rocks gets less productive (and less fun) as the sizes of the rocks remaining to be sorted from a batch gets smaller. Nowadays when I get down to a certain point I sift the remaining rocks through a screen so I don't have to hand-sort down to pinhead size. This screen is 1/4" wire mesh stapled over a square frame made of 2x2's.

The pebbles that fall through the screen into my catch sink get scooped up, rinsed, and set aside in a pebbles bucket. Once in a while I load a small tumbler with this material and shine it up (fine, prepolish, polish) to make a nice "polished gravel" for filling clear jars, etc.

Note, the metal screen leaves marks on the rocks, but these marks come off during fine tumbling.

Oiling the motor on a small Lortone:

After a few years my 3-pound Lortone tumbler started to make squeaking noises. A support person at Lortone told me I could fix this as follows: Disassemble the unit all the way to the motor, then take the motor apart too. (Note well the steps you go

through, and save all the parts.) Soak the motor bushings (only) in motor oil overnight. Wipe the parts dry and reassemble.

I've done this a couple of times now, and it works well. As of this writing my unit is over 10 years of mostly continuous operation with the original barrel, and I've replaced the lid liner ("boot") once and the drive belt (O-ring) once, but no other parts.

FYI here's the email I got from Lortone in 1996:

From: "LORTONE, inc." <equipment@seanet.com> (Doug Guthrie)
Subject: Tumbler motors

Most of the small tumbler motors last longer than a couple years in service. The mean time between failures is approximately 40,000 hours or 4.5 years of 24 hour/day, 365 day/year use. Of course this is just an average.

It doesn't take much shaft wear for the bearings to become noisy, but when it happens the best solution is to reoil it as you have done. Unfortunately, using a lighter weight oil won't help the problem. Too thin an oil actually causes the bearing to run dry faster as the oil wicks out during running. Remove the bearing plates and soak them overnight in a 20 wt oil. This should help. If it doesn't, consider replacing the motor.

PS: Don't run the belt too tight as this can put a lot of side pressure on the bearing and cause early failure. The belt should be just tight enough so that it doesn't slip.

Extending the life of the rubber barrels:

The rubber barrels are moderately expensive, about $20 for the 3-pound Lortone and $50 for the 12-pound unit. So you don't want them to wear out if you can help it.

I observe that most of the wear occurs on the ends of the barrels, not on the round walls. My theory on this is that it happens because the rocks and grit can't help but rub against the barrel ends. However they "stick" a little to the round parts of the barrel, tumbling rather than sliding, so almost no wear occurs on those surfaces.

You can replace Lortone lid liners ("boots") for about $5. In ten years my 3-pound unit has only needed one replacement boot, but the 12-pound unit was going through them every year or two. Also, the bottoms of the barrels were getting noticeably thinner. I developed several hacks that seem to help with these problems.

- I cut the outer rim off an old, worn-out boot from the big tumbler to make a rubber circle (with a wear hole in the middle) that would fit to the bottom inside of the barrel. I smeared the bottom liberally with silicone cement, squished the circle into it, and let it dry for a week or two. This has held up well, although the wear-hole in the middle of the old boot, which was full of silicone cement, started to eat through again.
- I stuck a blob of half-dry Liquid Nails cement on the centers (the fastest wearing parts) of both the boots and the barrel bottoms, shaped it into sort of a dome, and let it dry thoroughly. This "inner liner" is slowly wearing, but has

lasted for a while. I suppose other materials might work too, such as latex caulk -- cheap, but too soft?

Later: I've tried Liquid Nails (lasts longest), silicon cement (takes longer to dry and wears off faster), and hot-melt glue (wears well, but peels off the rubber too soon).

- I built a truck tire rock tumbler which I now use for almost all of my coarse grinding, except occasional rocks that can't take the stress and must be barrel-tumbled. This spares my 3-pound and 12-pound units from coarse grinding...

Miscellaneous Other Questions and Answers

These are collected from various sources and are in no particular order. The questions are mostly from other people, and the answers are mostly mine.

- **Does moss agate tumble very well?**

  Yes indeed it does. Also it usually has fewer inclusions or holes than many other agates. But not always. Some of the moss agate found in the Pawnee National Grasslands of northeast Colorado can be rather bubbly.

- **I add pellets to the medium and polish phases, but still find agates fracturing once in a while...**

  Pellets are not needed for agates, only for stuff that frosts. Meanwhile, if the agates still fracture, it means either the barrel is too empty, or more likely that they were just fractured and the coarse grinding didn't break them yet, but eventually they went to pieces under the continued gentle persuasion of the tumbler. I do occasionally see this too, I just shrug.

  My tire tumbler is so rough it tends to weed out the weaklings for me now. But then again I literally screen the washed stones with a 1/4 mesh to separate out the gravel toward the end of sorting, and I get 1/4-1/2 cup of gravel for each load. I do save it and sometimes just polish it, looks nice in glass jars.

- **If you buy slabs, do you just take a hammer and break them up?**

  I don't buy much of anything, I find my own, but I seldom bust anything with a hammer. Maybe if it's shaped weird I'll knock an end off or something first. But hammering creates cracks, so do it carefully. Too many rough stones break into smaller pieces anyway along existing cracks during rough grinding. I've seen videos showing people "preparing" agates for tumbling by smashing them with a hammer (loose or in a cloth sack), and I wince. Use a chisel, aim carefully, or get a bigger tumbler (grin).

I've bought broken (dyed) Brazil agate slabs by the pound and tumbled them to refinish them. This works great, and even these are seldom too big to go whole into my 12 lb Lortone rotary tumbler.

Someone else observed that usually slabs are created, sold, and bought to use for making cabochons (cabs). However, as long as they are not too big they are legitimate tumbling materials. Polished slabs or other relatively flat tumbled stones can be wrapped with copper foil and used to create "stained glass" panels or free-hanging window decorations that are very pretty.

- **I bought some slabs to try in the tumbler and I was wondering how to treat them. Can I just send them through the prepolish and polish with another load of rocks?**

  Sure, mostly. I've polished slabs OK. The large flat sides can remain less than glossy longer than most rocks, so longer polishing time helps. But in a 3-lb unit, you aren't talking very big pieces anyway. I'd just try it.

  Now, I do **not** put slabs in my truck tire tumbler any more unless I **want** them to break up into smaller pieces... It's just too rough. I put them in the 12 lb unit for coarse grinding -- although I try to minimize coarse grinding in the little barrels, to extend their life, I use the truck tire for most of it.

- **I assume they don't need the rough grit stage since they're already smooth.**

  The sides are saw-smoothed, but the edges are rough. If you don't coarse-grind, you'll still have some relatively rough edges, that's all. Up to you.

  Many of my tumble-polished slabs with nice rounded edges (from starting all the way with coarse grit), I wrap with copper foil for making window decorations using stained glass technique... Even rough slabs (already polished in Brazil) work, so long as the edges aren't **too** rough to hold the foil.

- **What is the difference between pre-polish and polish compounds?**

  There really doesn't seem to be much consistency here. The lapidary catalogs sell a lot of different powders by a mix of generic names like cerium oxide, brand names like Linde A, or just "prepolish", and it's always confusing. Plus, the same compound can apparently be used either way depending on the grain size! The only consistent fact seems to be that all polish powders other than diamond (typically not used in tumblers due to cost) is some sort of metal oxide.

  I've settled on cerium or tin oxide for final polish because it works well, even a mix (when I refresh old reused polish slurry by adding more powder to it). I've learned to avoid sapphire / alumina / aluminum oxide / Linde, or anything like "rouge" or "iron", because they don't seem to work well. Offhand though, I can't recall what I currently have at home for "prepolish"; I bought 5 lbs of something long ago. It's reddish, so it might actually be iron oxide (rouge); all

I know is I'm getting acceptable results from that (reusing the slurry) followed by cerium/tin slurry. I probably just bought something labeled or described as "a good tumbling pre-polish" and don't know what it is.

You can try going directly from fine (silicon carbide) to polish (cerium/tin) and run on it twice as long. I finally did this experiment, though, and wasn't pleased with the results. The rocks just weren't shiny enough for me.

Also, ironically, my pinkish cerium oxide that I use for polishing is not "optical grade" -- much more expensive, I just bought a couple ounces for $5 and even that is not pure white. One catalog lists "French cerium oxide" at $7 for 2 oz.

- **How do you get the lid off a Lortone tumbler barrel?**

  After unscrewing the "knurled knob" (black plastic) and taking off the aluminum washer, I use the round end of a bottle opener between the metal and the rubber to pop off the metal lid -- carefully, so as not to bend it, opening it a little at a time and working my way around. I think they recommend using the big washer for this, but that chews up the edge. Over time the bottle opener also mars the edge of the lid, so it cuts into the rubber roller a little while spinning, but it doesn't seem to hurt anything.

  Once the metal lid is off, I push out gently around the edge of the barrel while pulling up the inner rubber-covered disk by the center screw.

  I ground off the opposite point of the bottle opener so it wouldn't bite my hand while using it. (grin)

- **One of the main reasons that I asked for the tumbler in the first place is to try to tumble glass...**

  I find it's hard to get glass to take a good shine, it's too soft and "frosts", even when I ran it with pellets. However, beach glass is frosted too (shrug).

  I treat glass just like rocks except maybe I wouldn't mix them, just run pure glass. Also it's the **only** material I've ever seen outgas and expand rather than suck in the sides of the barrel -- watch for blowing the lid off, you might have to "burp" it every day or two.

  I have simply broken up colored bottles and started coarse grinding them, with OK results, except no glossy polish.

  Oh, being it's soft, possibly you could use less grit and run for less than a week. Dunno, haven't tried.

- **Is cabbing the actual breaking of the stone?**

  No, cabbing refers to creating a "cabochon", which is a hand-polished stone with rounded surfaces, usually for jewelry, all the way from cutting a rough

cab out of a slab to final polishing. "To cab" is an instance of English both abbreviating a longer word and verbing a noun.

You might be thinking of "cobbing", which I believe is a seldom-used word for smoothing a rough stone by chipping off parts:

1. To strike [Prov. Eng.] --Halliwell.
2. (Mining) To break into small pieces, as ore, so as to sort out its better portions. --Raymond.

- **I've often thought about tumbling cabs but was afraid to try...**

In 1997 Mark Liccini wrote (and I edited),

There is different media you can use to cushion the stones and carry the polishing agent. If you want your cabs to stay in calibration, you will need to shape and one sand first. So you are really just saving the finer sanding steps and polishing. But on hundreds to thousands of cabs that is a lot.

Because you are finer sanding and polishing only, you would want to run the tumbler on a low speed anyway. This and the media, pieces of leather, walnut shells, etc will stop the breakage.

Give you one further tip. Tumble-polished stones can be identified by a small, poorly polished circle dead center on the bottom. If you want to avoid this, give a quick sand to the bottom too before tumbling.

In 1998 Paul Boni wrote (and I edited),

A. No soft stones, most turquoise, opal and etc. will get too "beat-up" (maybe someone else has a technique for soft stuff).

B. Any heterogeneous materials of varying hardness will undercut. This includes agates such as "dry head" which have softer layers.

C. Cleavable minerals will cleave in the tumbler. Topaz, Charoite, Sodalite, and etc.

Most agates work great. I've also had good results with, quartz crystal (rutilated, amethyst, clear, and smokey), garnet, and colored glass. In an experiment with Mexican crazy lace, I found that by using the tumbler I could produce calibrated cabs with no more than 10-15 minutes total time in each cab (beginning with pre-slabbed material).

The method: I rough the stones on a coarse 6" diamond grinding wheel. Only the small ones were dopped. The stones are then sanded on a fresh 220 grit silicon carbide belt on an expandable drum. I run my expandable drum slower than most folks so I can use the "give" of the rubber to wrap around the stone and reduce the ridges produced. (I can't get this part to work with diamond.) If done right (only a little practice is needed) agates finish this step with no

ridges whatsoever. I then turn the stone over and kiss the sharp edge from the back of the stone. I should also note that I cut most of my cabs with a bevel.

The stones go into a Vibrasonic tumbler (manufacturer doesn't matter) with 600 grit and only enough water to allow the grit to cling to the stones. This is important! Most people use too much water.

I load the tumbler with the cabs and enough scrap (of the same material) to the weight specified by the manufacturer. Then I add a heaping teaspoon of grit (I use a 4 lb. tumbler). Then I turn it on dry and slowly add water until two things happen: 1) I see the grit clinging to the stones as they cycle to the top of the heap, and 2) the action of the stones becomes less violent and the heap rolls over on itself with a steady action. At this point the sound will be much more subdued as well.

I run for 12 hours, clean and rinse the load and repeat. After 24 hours, I inspect the load. This is usually enough. If needed the load can be run again. The load is then cleaned, prepolished, and polished. I get a high polish, minimal size reduction (can't measure any) and only a slight rounding at the dome, bezel edge. Too coarse a grit or too long in the grit will produce more rounding of the edges, deformations, and size reduction.

The important thing is to experiment with your tumbler and the material you are cutting. Keep notes! And modify your technique to fit the occasion. No one cookbook technique or formula will work for all cases and situations. Be patient and when you hit on a method that works for you, write it down, remember it, and (share it).

- In 1998 Anthony L. Lloyd-Rees wrote (and I edited),

  ...hopefully you have a small barrelled tumbler because you won't want to share your cabs with any other stones and you will need enough preforms to make a tumbler load.

  Second, all the same size helps.

  Third, all the same material helps a lot.

  Fourth, glue the stones of the same size back to back. This stops that little dent in the back of the stone from happening and also keeps a crisp girdle line. Also this practice preserves calibration and prevents chipping if you are using a rotary tumbler [which he disdains].

  Note: The more care you take in accurately shaping preforms the better looking cabochons you end up with.

  The grit size you start with is determined by how much stone you estimate needs removing, if larger than the finest is needed the shape will suffer. The cutting stage should be kept as short as possible anyway. Use your usual polishing techniques and compounds for the material you are tumbling.

I have only tumble finished stones cut with automatic cutting equipment. A tumble polished stone cannot withstand a 10x loupe. at least mine didn't. I feel personally that automatic preforming is the only excuse for tumble finishing.

I have never tried this with hand cut stones, I couldn't imagine anything worse than putting the effort into getting a nicely shaped stone and then missing out on the good part where you make it come alive in your fingers. I always thought this was the magic part, the moment the rock turns into a gem...

In 1998 Ted Robles wrote (and I edited),

Tumble polishing cabs. Yes, it can be done. I have done it, with good success, using tin oxide in honey with 4 mm glass beads as carrier. The thing to remember is not to cut the edges to razor sharpness. They need to be about 1 mm thick to withstand the occasional edge-to-edge impact. (I am assuming cabs of jasper, agate, or similar hardness.) Don't crowd them. About 2 volumes of beads to 1 volume of cabs is about right. (In a conventional tumbler it takes a week to 10 days.)

- **Can you tumble-polish beads?**

  Apparently so! See this excellent website on the subject.

- **If tumbling a hard stone like petrified wood, do you have to tumble it longer?**

  In general, yes, depending on how round and smooth you want it.

  In particular some petrified wood has a "bleached rind" that's lighter than the interior. Often I stop grinding those pieces while the rind is still present, for a nice two-tone effect in the finished piece, even if it retains rough edges.

- **How long in the midst of a tumbling operation is it safe to leave the tumbler idle?** (Before slurry settles and does bad things inside the barrel, etc.)

  I've left my tumblers off for as long as 11 days I think, at any point in the weekly cycle. I've had no problems firing them back up when I return. I'm sure the slurry settles inside, but it doesn't harden like concrete so long as it stays wet, and the barrels turn over just fine after I flip the power back on. Note well that the barrels remain sealed.

  Furthermore, given how the slurry does settle out, I'm wary of letting it run down any drains (at least I minimize it). It's not that you couldn't wash it down with a hose, at least if it's never dried out, but as someone else said (in email), how do you get the water pressure to the clog in your pipe?

- **Fill a concrete mixer with your favorite rocks, add playground sand, and let it tumble a couple of weeks.**

This is something I've fantasized about but never tried. Cement mixers are not really cheap, like $180 and up for small ones new. Moreover I suspect the rocks and grit would chew up the insides in a hurry, they are probably bare metal and not designed for continuous use. You'd need to line them with spray-on truck bed liner or something first?

Also, any tumbler needs protection against rocks and slurry escaping -- probably not an issue with a cement mixer -- and against drying out -- you could probably cover the opening with a plastic sheet held on by a bungee cord or something.

If you're reading this and you've actually tried using a cement mixer as a rock tumbler, please let me know.

After I wrote that, I got the following from Susan Belyea, who said,

I have been using a cement mixer with a plastic barrel (steel is too noisy) to tumble glass cullet (waste product from my glass-blowing production operation) and it works fine. Splashes a bit -- I don't try to seal the mouth of it, just a hang a plastic sheet close-by to deflect the splashing. It takes 12-15 hours of tumbling 20 lbs of small chunks of glass with fine grit silica sand (which I use because I have tons of it around the shop; silicon carbide might be better) and a few gallons of water to get a nice frosted finish without obvious chipping on the edges of the glass.

Regarding the wear and tear on the plastic (cement mixer) barrel; it really depends on the model of barrel. The simplest barrels -- no undercuts in the mold making process with steel fins -- lasts just fine. There is a model called The Big Cat available at hardware stores all over which is ***not good for this purpose****. I cracked a barrel twice with this model -- seems like there are too many places for glass to get stuck, and while I don't completely understand it, I switched to a different model and have no trouble.*

I am only processing about 20lbs of glass in a pretty standard size cement mixer. I use only enough water to get a loose slurry going. I suspect if I tried to process larger loads, I'd get more splashing.

- **What do you do with all the tumbled rocks?**

  Uh, that's an embarrassing question. (grin)

  Well the short answer is: I give most of them away, and ultimately I'm just borrowing the rest from my descendents and everyone else on the planet. I'm pretty sure that in a million years someone will find one of my polished rocks somewhere, they'll have no idea who or how it was produced, but they'll recognize it as clear evidence of intelligent manufacture.

  Tumble-polishing rocks is fun for the sake of the process itself -- traveling, rock-hunting and collecting, cleaning and sorting, grinding and sorting (including a certain amount of "playing in the mud"), polishing and sorting.

The result is 10-15 pounds per month of polished stones ranging from junk to treasures, although even my "treasures" are generally not on par with the commercially available mass-produced stones you can buy at nature stores, etc. Nonetheless I enjoy the hobby and have not noticed a decline in my interest level.

When I dump a polished load of rocks I sort it into "keepers" and "give-aways" while listening to radio or in front of the TV. The "keepers" add up for a while in flats, then I sort them further by type into other flats, which I shelve. This does seem kind of silly, hiding them away, but there's a limit to how many rocks can be out on display in plain sight! Certainly the more special (to me) rocks end up in various places around my house. I find it handy to put them on or in paper or plastic bowls or trays so it's easy to move them for dusting, etc.

As for the give-aways, there seems to be an endless demand for free polished rocks. I take them to monthly Fort Collins Rockhounds Club meetings for other people to pick over. I offer them to anyone who visits my house, including relatives from far away. You'd be surprised how many people go from, "nah, thanks," to "OK, well just a few." At Halloween I set up a few flats under a light just inside the door and invite the kids, "two pieces of candy and as many rocks as you want to take!"

Finally, one more observation. "The more of anything, the less the value of every such thing." I've noticed that over time my previous "keepers" are easier to part with and often become "give-aways". There's a continual winnowing or high-grading process that's enjoyable, although time-consuming.

Vibratory Tumblers

As I mentioned up front, my limited experience with vibratory tumblers was not good, so this webpage is mostly about rotary tumbling.

In 1997 Terry Ensell and Julene Kanies wrote (and I edited),

Regarding the vibratory tumbling instructions: I use 60/90 grit to start with. But, I did have my grinding bowl coated with Rhino Lining, which is the stuff they coat pickup truck beds with, after I wore out a barrel after three loads when I didn't heed the part of the instructions that said not to do that.

As a matter of fact I was able to have the same barrel coated that I had worn out. I have a 50 pound barrel and it cost me $25 to have it coated, which was cheaper than the $80 another barrel would cost, which you should have anyways for polishing only. It holds up very well even though it did seem quite soft, and it quieted it down a lot, which was great as it was very noisy.

I might also mention that if you have a barrel coated, you need to score, scratch and abuse the hell out of the barrel before it is coated or it will peel off.

I grind for about three days with the 60/90 making sure twice a day that the slurry is not building up to a point where the rocks are not vortexing around the barrel. I add water as needed. If the slurry does get too thick then rinse it out and restart it. I check the rock and if it is not ground enough I redo the grit again and run it for two to three days again.

If it is hammer cracked rock you may find you need to do the 60/90 two to three times to get it smoothed up. ***Do not*** *rush this step. If you are polishing river run rock, just the three days of 60/90 will do.*

Then take the rock out and ***completely*** *clean rock, barrel and lid. Add 220 grit and grind for three days checking twice a day to make sure slurry is not too thick, adding water as needed. Again,* ***completely*** *clean everything and go to 500 grit and do this for three more days and check it once again twice a day.*

Now as I mentioned you really should use a separate barrel for polishing only. I use TXP for polishing compound and usually get a great polish in one to two days. I usually just add some Ivory Flakes to the polish mix and then run it for about 15 minutes and rinse it out and let it dry out and you are done.

A couple other things I might mention is that you need to have a variety of sizes of rock to get a good grinding action, and you should have rock of the same hardness. For the above steps I have used agate and jaspers and have gotten good results.

Another thing I do during the first three grinding steps is to add a little Dawn dish detergent to the barrel to decrease surface tension and allow for better grinding action. If for some reason you are not getting a good polish, try adding plastic beads to the polishing cycle and check it again. If the results are still not satisfactory it may be that more attention needs to be paid to the cleaning between grits.
(End of quote from Terry Ensell and Julene Kanies.)

My Tumbler Shop

My tumbler shop has grown into quite an elaborate (but enjoyable) operation.

- The setup is in my basement utility room. It's cool year-round and blocks most of the operating noise from my three (3!) tumblers. I covered most of the concrete floor with some cast-off carpeting I scrounged.
- I added overhead fluorescent lighting controlled by a wall switch, a 120V switchable power strip on the wall, an AM/FM radio and a couple of "spot" lights controlled by the power strip, and a phone. I also bought a "baby monitor" on sale. I put the transmitter end in the tumbler shop and the receiver in my bedroom so sometimes I could monitor the operation by its sounds, although I don't bother much any more.
- There's a floor drain and fresh water available in the utility room. I added copper plumbing to run to a new spigot and hose connection, from which hangs a short length (18" or so) of flexible hose and a hand sprayer, over a large plastic sink (wash tub), the latter about $20 from Home Depot. In the

nearby photo you can't see much of the plumbing, but note all the buckets of rock in various stages of processing.

- The sink drains into a 23-gallon plastic tub which I refer to in nautical lingo as a "spooge bucket". I let the slurry settle out of this dirty water as long as possible after running water down the sink and stirring it up. In the nearby photo note how the sink is up on cement blocks to a comfortable height, and the spooge bucket is also up on blocks so it can be siphoned to the filter bucket. It's a little hard to photograph this since the water heater is in the way. My pebble screen hangs on the wall to the left, and a towel on a screw to the right.
- Suspended in the bucket, held in place by a wooden contraption that clamps across the diameter of the bucket, is a cheap plastic hand-pump siphon device. The intake end is a few inches above the bottom of the spooge bucket.
- The outlet end of the siphon goes to a 5-gallon plastic "filter bucket". The plastic outlet hose is held to the edge of the bucket using a plastic spring clamp. The side bottom of this bucket has a plastic hose going out through a hole I drilled, sealed with plumber's putty, which directs water into the floor drain. (I cut a larger hole in the drain cover to fit this hose.) The filter bucket has a layer of coarse gravel on the bottom. I bought a pair of cloth pillowcases cheap at Goodwill and use them, one inside the other, to line the filter bucket, folded over the top rim. Inside the pillowcases I put two paper bags, one inside the other. Oh, also I hung some ribbed plastic sheeting inside the bucket, outside the pillowcases, to keep the fabric from just sticking to the wall of the bucket.

  The purpose of this contraption is to capture as much silt as possible before it goes down the drain. I try to let the spooge bucket settle for several days before siphoning it into the filter bucket, but it's not always easy to wait for it to settle between uses of the sprayer and sink. Crud does get caught in the paper bags. When they are clogged enough, I replace them and wash out the rest -- outdoors, or back into the sink and spooge bucket.

  In the nearby photo you can see some of the gallon jugs of reusable prepolish and polish compounds. The yellow pipe is the gas line to the water heater in the back of the picture. You can't see the plastic hose out the back of the bucket into the floor drain.

- Quite possibly it would be just as effective to siphon the spooge bucket into 5-gallon plastic buckets, let them settle for a long time (say a week), and then just dump the mostly clear water on top into a toilet and flush it.

  I think the ideal setup would be a simple way to direct the sink drain to any one of several large spooge buckets in rotation, so each one could sit undisturbed for a week or so before siphoning it off.

- I also added a lot of wooden shelving in my tumbler shop, including open screw eyes under the shelving from which to hang empty plastic buckets of various sizes.

Assorted Other Tidbits

This section is a collection of miscellaneous other trivia about rock tumbling and my tumblers that doesn't fit in the questions/answers format or other sections above.

- **Tire tumbling in your car**: When I was building the tire tumbler, I did some math on the physics of the subject (which I still need to add to this page). I had to figure out what seemed like a good wall speed, hence rotation rate, hence motor to pulley to drive shaft ratio. (The 5/8" drive shaft is tiny compared with the 31" tire, so it squeeks like crazy if the tire is overloaded, and it can even give up completely with the tire stopping in place.)

  Anyway, the tire takes about 8 seconds per rotation, which means it runs at about 0.7 MPH. (First number from memory, second number calculated based on a 31-inch tire, although I started with a 33-inch tire originally, but I can't find those any more.) This seems to be a pretty good speed. It does an effective job of fast grinding, although it busts up some rocks that are already cracked (maybe this is a good thing) and it leaves some crescent-shaped impact scars in larger stones (we're talking baseball-sized here!) that remain after polishing.

  When the first tire wore out years ago, I estimated how many hours it had run, and from that figured I'd gotten about 450 miles out of it. (Also from memory.) Just goes to show that tire tread is a lot better at handling rocks on the outside than on the inside. (grin)

  Anyway, now you can see why you can't put rocks in your truck tires and drive around -- unless you do it **really** slowly -- and then you'll wear them out **really** fast anyway. If you drive much faster, centrifugal force pins the rocks to the inside of the tread!

Hand Polishing

This being a webpage about tumble-polishing the following section doesn't really fit, but someone asked me so I wrote it up and might as well save it here... "Extra credit."

I was wondering if you could describe your (hand) polishing technique.

Nothing fancy, I own a 10" Tagit diamond dropsaw (slow but functional for cutting ends where needed), a Richardson's Rock Ranch high-speed dry sander, and a Richardson's leather buffing wheel. These are all bolted down in the garage where I occasionally find time to go play during warm-enough weather.

The rock saw is useful for initial smoothing of an end where required, but it takes patience, and it does not produce as smooth an end as a good automatic saw would. It's hard to avoid saw marks (crescent-shaped indentations). Then again you can use it to hand-pre-form the convex surface a bit if desired.

The dry sander is effective but tricky to use compared with wet diamond or silicon carbide wheels -- you **must** avoid overheating the rock, and also breathing the dust. (Note, all three pieces of equipment together cost about the same as one Diamond Genie...) I keep a bowl of water right below the paper sanding wheel (which is upside down, you hold the rock up to it) and dip it every few seconds. The water on the end of the rock also gives you some idea where you are hitting as you work the convex surface. I wear a dust mask or for longer sessions a respirator mask.

It's nearly impossible to get a good shine in the center of a perfectly flat end, or (with the rubber disk on a Richardson's sander) even to keep the end perfectly flat. Every stone ends up domed at least a little.

Sanding sheets are about $1/each. Unfortunately they cut great for a minute or so when fresh, then have a long mid-life where they work OK but are prone to be slow, cause heating and spalling, etc, before they wear out. Anyway I go through coarse (60), fine (220), and two levels of prepolish sheets. I keep a table lamp aimed at the work and often wear a binocular magnifier for close inspection.

I'm a perfectionist, but especially with irregular rocks like fossil wood you eventually say "good enough" and go on. I aim to remove all visible scratches, but a perfectly regular convex surface without any pits or cracks is hard to achieve.

Finally the rocks are polished with cerium oxide, wetted with a spray bottle of water, on the polisher. I keep a shower cap over the leather wheel when not in use to keep it uncontaminated. I feed the wheel fresh oxide by wetting the end of the stone with the spray bottle, pick up a little cerium powder, then "dress" it onto the wheel (previously wetted too) and get to polishing. A little cerium goes a long way.

The Richardson's buffer lets you apply a **lot** of force before it stalls. I do this being careful not to catch an edge and fling the rock out of my hands. Sometimes with softer stones you can actually correct many prepolish sins with several minutes of high-pressure polishing.

The cerium sticks to the rocks in crevices, etc. I get rid of it by water spray pressure, toothbrushing, soaking in soapy water, etc.