Instructions for Making a Nut Sheller
From the Full Belly Project
www.fullbellyproject.org

This is what your sheller will look like when it is completed.

Stator                                    Rotor                             Rotor in Stator

The stator and the rotor are the two parts of the sheller that you will make and put together. The rotor is mounted in the stator.
The steps in building a sheller are:

A. **Assembling the molds** for each part.

B. **Mixing and pouring the concrete** into the molds.

C. **Assembling the sheller.**
   a. Removing the parts from the molds
   b. Assembling the sheller

D. **Adjusting and testing the sheller.**

E. **Troubleshooting**

Special Note: All the parts are named and numbered. The directions will refer to both the name and number of each part. The part name will be in **bold**.

**Assembling the Molds**

There are two sets of molds, one for the stator and one for the rotor. Each mold set has an inner mold and an outer mold.

**Stator Molds:** The stator is the concrete piece that makes up the outside of the machine and does not turn.

Stator Mold Set

1. Outer Stator Mold
2. Inner Stator Mold
3. Plastic Sleeve
4. Bent Anchor Bolts
5. Long Stator Rods
STEP 1: Assemble the Outer Stator Mold (#1).

Tighten the bolts that hold the two sides of outer stator mold together. Do not over tighten bolts.

If molds have been used before, check that side expansion joints are free and clear of any residual mortar or foreign matter of any kind that would prevent the mold from sealing.

STEP 2: Grease Inside of Outer Stator Mold (#1).
Wipe inside of Outer Stator Mold generously with cooking grease. This keeps the concrete from sticking to mold.
STEP 3: Install Plastic Liner (#3) over Inner Stator Mold (#2)

Slide Plastic Liner over Inner Stator Mold. Try to make the liner fit around the mold as smoothly as possible. ANY FOLDS IN THE PLASTIC WILL MAKE A WEAK SPOT IN THE STATOR.

STEP 4: Insert Bent Anchor Bolts (#4)
Insert four Bent Anchor Bolts into four holes in Inner Stator Mold, leaving any two opposite holes open as shown. Be sure to turn rods so that lower tips are one finger width away from the plastic liner. Place one washer (#17) and one nut (#18) above and below the lip. The end of the bolt sticks out three finger widths.

STEP 5: Place Inner Stator Mold (#2) in Outer Stator Mold (#1)
Insert Inner Stator Mold into Outer Stator Mold. Center pin in bottom of Outer Stator Mold fits into hole in center of Inner Stator Mold. Rotate the inner mold so the open holes are immediately above the open holes in the bottom of outer mold.
STEP 6: Insert Long Stator Rods (#5’s)
Insert Long Stator Rods into the two remaining holes in Inner Stator Mold. Each rod passes through a hole in the bottom of Outer Stator Mold and is secured by one washer (#17) and one nut (#18) on each end. At the narrow end of the stator mold, the ends of the rods do not extend past the wood base. The rods have a slight “S” bend. Rotate the rods so the ends of the rods are perpendicular to the molds. (See illustration). Tighten nuts, but DO NOT OVER TIGHTEN. The Stator Molds are ready for concrete.
Rotor Molds: The Rotor is the concrete piece that is cast around a central shaft. The rotor is the piece that turns inside the stator.

STEP 1: Grease Inner Rotor Mold (#7)
Locate Inner Rotor Mold. Wipe smooth exterior surface of the inner rotor mold with cooking grease or heavy oil. This ensures an easy release of the concrete from the mold.

STEP 2: Grease Outer Rotor Mold (#6)
Locate Outer Rotor Mold. Wipe entire inner face of the outer rotor mold with cooking grease or heavy oil.
STEP 3: Mount four Rotor Rods (#8’s) on Outer Rotor Mold (#6)
Install Rotor Rods with one nut (#15) and one washer (#14) on both sides of Outer Rotor Mold. Each bolt sticks one finger width outside the mold.

STEP 4: Insert Rotor Shaft (#9) into Outer Rotor Mold (#6)
Insert the Rotor Shaft into the center hole of Outer Rotor Mold, threaded end first. The threaded end must be facing down otherwise you will be unable to assemble your machine.

STEP 5: Assemble the Stool.
Assemble the stool by attaching legs (#22) to the base (#20). The flange (#21) must be on the same side as the legs, facing towards the ground. Next, screw the pipe (#19) into flange on the base.
STEP 6: Set Outer Rotor Mold (#6) on Stool
Place **Outer Rotor Mold** on the stool by sliding threaded end of **Rotor Shaft** into the hole in the center the stool. The four bolts sticking out of the mold should drop into the four holes on the **stool base**.

![Image of outer rotor mold on stool]

STEP 7: Securing Outer Rotor Mold (#6) with Lock Nut (#10)
Spin **Lock Nut** onto thread end of **Rotor Shaft** and hand tighten.

![Image of locking nut onto rotor shaft]
STEP 8: Put Inner Rotor Mold (#7) into Outer Rotor Mold (#6)
Slide Inner Rotor Mold onto Rotor Shaft. Pressing Inner Rotor Mold tightly into Outer Rotor mold, slide wood clamp (#11) onto shaft and tighten.

B. Mixing and pouring the concrete into the molds.

STEP 1: Mix two parts of sand and one part cement. Add water until you get a thick consistency slightly wetter than mortar mix. CAUTION: Use hard sand, sand blasting or river sand. Sand the size of a grain of rice is perfect. Avoid fine sand or crushed coral.

STEP 2: Pour Concrete into the Rotor Mold (#4)
Pour concrete into mold. Tap often with wood block to remove air bubbles. Fill until concrete is within one finger width of the inner rotor mold lip. Make sure top of mold is level while concrete sets. Important Note: Use a bubble level if available, or just do the best you can to level out the assembly, for this ensures the rotor runs "true" inside the Stator.
STEP 3: Pour Concrete into the Stator Mold (#2)
Pour concrete into mold, making sure cement does not get between plastic liner and inner rotor mold. Hit side often with a piece of wood to remove air bubbles. Fill within one finger width of the top of molds. Set on level surface.
C. Removing Parts from Molds
Assembling the sheller.

It is important that the working surfaces of your sheller are rough. Rough surfaces will shell nuts correctly. If the surface is too smooth, the nuts will slide and not be shelled. Rough working surfaces are made by wire brushing the concrete before it’s too hard.

IMPORTANT NOTE: SETTING TIME FOR CONCRETE VARIES WITH TEMPERATURE AND MANUFACTURER. Let concrete set for six hours and test.

Testing the hardness of the concrete
STEP 1: Remove wooden clamp
Remove wooden clamp from the top of the rotor shaft.

STEP 2: Pry Out Inner Rotor Mold
Gently pry out Inner Rotor Mold using bottom and top brackets.

STEP 3: Checking for Hardness
Using wire brush, brush the inner surface of rotor to test for hardness. If brushing roughens the surface without digging in, proceed to next step. If wire brush digs in check again in an hour, continue checking until brush does not dig in.
STEP 4: Locate Rotor Mold, and remove bottom Lock Nut and lift Rotor Mold off of the stool.

STEP 5: Remove Nuts
Remove four nuts from mold, so that the attached threaded rods will release.

STEP 5: Remove Rotor From Mold
Place mold on blocks with rotor shaft between the blocks with threaded end up. Hit side with piece of wood to loosen. Drop the whole assembly gently onto the blocks until the concrete releases. Rough the curved surface with the wire brush.
NOTE: To assure that your sheller does not break the nuts. You have to have your surface centered to the shaft.

STEP 6: Check for centering

Slide top and bottom brackets on each end of rotor shaft. Set brackets on blocks as shown in picture. Thread handle onto rotor shaft as far as possible. Place a straight piece of wood or metal (a brace) (to be included in kit, need a part number) parallel to the surface of the rotor. Turn handle clockwise and check space between rotor and brace. If space is constant, your rotor is in round. If not, use the cut end of lock nut to remove high spot until rotor is centered to shaft. Only the bottom third has to be centered. Round the bottom edge. The bottom of the rotor is the wide end.

Proceed with out delay to next step because concrete is setting.

STEP 7: Remove Inner Stator Mold
Remove all six nuts and washers from top of mold. Using the top and bottom bracket, pry and lift out inner stator mold.
STEP 8: Remove Plastic Liner
Pull Plastic Liner out. Save Liner for later use. (However if it does rip it is easily replaceable).

STEP 9: Brush Inside of Stator
Leaving stator in outer mold, brush the inside surface of the stator using a wire brush until the surface is rough. Let set for 12 more hours.

STEP 10: Remove Outer Stator Mold
Turn over mold on SOFT GROUND to avoid bending exposed threaded rods. Remove 2 remaining nuts.

STEP 11: Loosen Expansion Joints
Loosen nuts holding expansion joints closed. Pry both joints open about two finger widths.
STEP 12: Release Mold from Concrete
Tap on side of mold with brick or similar object. Be careful, do not damage mold.

STEP 13: Lift Mold Off Stator
Tap with block of wood and lift mold off stator. Smooth the inside edges by scraping the upper rim with a flat metal object.
D. Assembling the sheller.

It is important that the top and bottom brackets are installed so that the rotor is perfectly centered inside the stator. The top and bottom brackets are mounted on the ends of the long stator rods.

**STEP 1: Attach Center Top Bracket**
With the wire brush, remove excess cement off the exposed part of the threaded rods. Set top bracket (short one) on exposed threaded rods with loose nuts and washers. Center pipe in opening. Tighten the nuts.

**STEP 2: Add Heavy Machine Grease**
Pack as much heavy machine grease as possible into top pipe.

**STEP 3: Turn Stator With Top Bracket Upside Down on Blocks**
You will want to set the stator with the attached top bracket on top of concrete blocks (cinder blocks) or something of a similar shape, being careful that the bracket is suspended between the blocks and off the ground.
STEP 4: Place Rotor in Stator
Gently insert threaded end of rotor shaft into top bracket. If shaft touches ground, raise stator higher.

STEP 6: Grease Bottom Bracket Pipe
Pack bottom bracket pipe with heavy machine grease.
STEP 7: Identify Long Stator Rods
Identify the other end of the long stator rods that are holding the top bracket on. Place a nut and then a washer on the bottom end of each rod as close to the concrete as possible. Note: the nut is installed closest to the concrete, then add the washer.

STEP 8: Attach Bottom Bracket
Slide pipe onto shaft so that welded washers drop on to long stator rods.

STEP 9: Secure Bottom Bracket
Secure Bottom Bracket with nuts and washers as tight as possible.

Note: It is important to mount your sheller on a sturdy and stable stand. A stand can be made of wood, metal, or a half of an oil drum.
STEP 10: Turn Machine On Side Then Install Washers
You will now carefully, with two people turn the machine on its side. Grease 4 (four) large washers, on one side only, and install onto the threaded end of the rotor shaft.

STEP 11: Attach Turning Handle and Lock Nut
While the machine is still on its side spin the handle onto threaded shaft, and install lock nut after, as shown. Now set the machine up on blocks with handle upward. The rotor should drop, if it does not, knock with piece of wood until it does.

STEP 12: Attach to stand.
Stand can be made of wood, metal or ½ of an oil drum.

**Bolt to wood or metal stand.**

**If using an oil drum, Attach Wooden Supports**
Cut and drill wooden supports. You can figure out where the holes should go by placing a support on the threaded rods then hitting the top of the wood with the other support, leaving an indentation from the threaded rods to show you where the holes should be. Drill holes twice as large as threaded rods. Attach to bottom of machine using a washer and nut on each threaded rod. Do not over tighten.
STEP 13: Attach the Metering Plates. Metering plates bolt to the top of the rotor. Install the larger half-circle plates first so that the notches meet. Then install the small plate on top, securing it with a wing-nut. Rotate the smaller plate in either direction to open or close gap. THIS IS SHOWN OUTSIDE THE SHELLER BUT YOU WILL ACTUALLY BE DOING THE STEP WITH THE ROTOR INSIDE THE STATOR. Make sure the metal plates do not touch the inside of the stator or the stator will not turn freely.

Note: If the nuts you are shelling are very large, a third metering plate may be necessary. See photo:

This finishes the construction and assembly of your nut shelling machine.

D. Adjusting and testing the sheller.
To adjust for shelling smaller or bigger nuts raise or lower the rotor. Raising the rotor decreases the gap between the rotor and the stator. This allows smaller nuts to be shelled.

Similarly, lowering the rotor increases the gap between the rotor and stator. This allows for shelling larger nuts.

If the gap is too small for the nuts being shelled, too many will be broken.
If the gap is too large, too many will pass through unshelled.
If the rotor is not centered in the stator, or if the rotor has a wobble on the shaft, nuts will pass unshelled on one side of the rotor and be broken on the other.

This design of sheller can be adjusted to shell nuts within a narrow size range. If the supply of nuts you are shelling varies widely in size, you may experience some of the nuts passing through unshelled (the small ones), some being shelled correctly, and some being crushed. In this situation, adjust for the larger nuts, then sort out unshelled small ones and pass them through at a different adjustment. An alternative is to sort the nuts first.

Metering plate adjustments: The function of the metering plate is to regulate the flow of nuts into the working part of the sheller. If too many nuts fall through at one time, the sheller risks clogging and the handle becomes too hard to turn.

If too few nuts fall through at once, the handle is easy to turn but few nuts are shelled for the effort.

**STEP 1. Adjusting Rotor Height**

To lower the rotor, release the lock nut by turning lock nut handle counterclockwise. Placing one hand on the rotor, turn the handle in a counterclockwise manner. You will feel the rotor go down. This action increases the gap between the rotor and the stator, and allows for the shelling of large nuts.

Similarly, once the lock nut is released, turning the handle in a clockwise direction will raise the rotor. This allows for the shelling of smaller nuts.

With the lock nut loosened, you must keep one hand on the rotor in order to keep the rotor from spinning during adjustment.

Each time the rotor height is adjusted, you must tighten the locknut against the handle.

**Adding Nuts - Getting started:** Shell several nuts by hand. Drop one of the larger ones through gap in metering plates. If the nut falls through the bottom of the machine, raise the rotor by turning the handle clockwise. If the nut fails to drop through, lower the rotor until it does. At that point, tighten the lock nut.

**Fine Tuning:**
Place a basket or cloth on the ground under the machine to catch the empty shells and shelled nuts that pass through the machine. Fill machine with a quantity of nuts and shell them by turning the handle of the machine in either direction. If breakage rate is high, lower rotor. If too many nuts are unshelled, raise rotor. If you have nuts with a wide variety of sizes you may have to adjust machine to shell the larger nuts first. Then separate out the smaller, unshelled nuts, re-adjust the machine, then shell these smaller nuts as a second step.

**STEP 2. Adjusting the Metering plates.**
If nuts shell too slowly, loosen wing-nut on metering plate and rotate small plate to make the space between the bottom plates larger. Retighten

If machine clogs, make space between bottom plates smaller.

When shelling nuts for seed purposes, best results come with a slow shelling speed.

**STEP 3. Making a replacement Plastic Liner:**
Try to use the old liner as a pattern. Once you've cut out the part for the plastic liner go ahead and seal the seam with electrical tape. If any liner is left above the mold trim it with scissors. Once you’re done simply slide the liner on top of the mold. Your will then be able to reuse the liner in quite a few more machines.

**E. Troubleshooting:**

**Problem:** The rotor or stator break when removing it from the outer mold.

**Cause:**
1) Too little cement with the sand  
2) Sand may have been dirty  
3) Part was removed from the mold too early.

**Solution:** 1) Break concrete apart with hammer, clean metal parts with wire brush and reuse.

**Problem:** When turning the handle while trying to shell nuts, the handle and the locking nut turn together, while the rotor does not.

**Cause:** The locking nut is not tightened enough.

**Solution:** Tighten the locking nut securely, hitting with a small block of wood or a rock if necessary.

**Problem:** When removing the outer stator mold, the bolts on the narrow end of the mold do not pass easily through the mold.

**Cause:** The “S” shape of the long stator rods went in backwards. Rather than the bolts sticking out perpendicular to the top of the mold, they stuck out at an angle that does not allow the mold to be easily removed.

**Solution:** Do the best you can to remove the mold. This may end up making the holes in the stator mold bigger as the bolts are forced through the fiberglass, but it should still give you years of good service.

**Problem:** The nuts you are shelling are either very large or very small, and the rotor cannot be adjusted enough down or up to shell the nuts correctly.

**Cause:** Rotor needs to be raised or lowered more that the existing thread count on the top of the rotor rod will allow.

**Solution:** Additional adjustments of the rotor height can be made by
1) adding or subtracting the big washers below the handle.
2) Loosening the “U” bolt nuts that secure the top pipe to the top bracket, move top pipe up or down as needed. Retighten “U” bolt bolts.