1. Clay castoffs from the local brick factory. This clay was dug from a source nearby and pressed into roofing tiles and bricks. Discarded prior to firing, this clay has been "aged" for weeks, giving it better properties than clay used immediately from the source.

2. Breaking up the clay: using a crusher comprised of a wood block(6x6in) with two wooden handles, the clay is broken into smaller pieces so that it can be fed to the hammer mill to be pulverized.

3. The hammer mill: this hammer mill is usually used for grinding maize. Mesh screens fit at the bottom and determine the size of the clay powder. Different size screen meshes are interchangeable in the mill to determine the size of the clay particles.

4. The dry milled clay is stored in cloth sacks(similar to those used for rice) for future use. 60 lbs of dry milled clay is mixed with 22 lbs of sawdust. This amount can produce six water elements. Filtron's workshop can produce about 50 filters per day.

5. In volume, the ratio is 1 clay to 1.5 sawdust. Ratio in weight is 1 clay to 3 sawdust(Because every clay is different you will find a great variation in absorption rates, each clay should be tested starting at a 50/50 mix, then making appropriate changes from there).

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6. The dry clay is put in the cement mixer at a speed of 60rpm(the normal speed of most cement mixers to fast so a reduction box or pulley systems are used to reduce the speed) and mixed with the sawdust for 10 minutes. 2.5 gallons of water is then slowly added while mixing for 10 minutes longer. This is cement mixer is used for mixing the clay/sawdust mixture. The cement mixer is positioned close to the press and next to a work bench that is used to form a 16lbs ball of mix.

This picture shows the bottom plate of the hydraulic press. It is very important to place a thin(~0.5 cm)waterproof, treated plywood bat on the bottom plate so the filter is easily removed without touching its sides. The plywood bat, and male and female parts of the mould are covered in thin flexible plastic so the clay mixture doesn't stick to the mould.

7. The clay is put onto the female mold with the bat in position and punched into place.
The male portion of the mould is covered with the thin plastic bag and then positioned over the female portion. The press needs to have guides so that the male/female portions of the molds are lined up consistently, thereby ensuring uniform wall thickness from filter to filter.

The hydraulic press consists of a 12 ton automobile jack with a (pneumonic air assist adapter) hydraulic adapter which is connected to a (minimum 100 psi compressor). The press is capable of exerting 10.2 (psi) mts. of pressure evenly and consistently. One of the problems with manual (screw presses) presses is that less pressure will be applied over time, and filters produced at the end of the day will differ in density from those produced at the beginning of the day (Technical note: Manual hydraulic truck jacks with the air assist have also been used successfully and are also recommended where the electrical source is not dependable).

This is the clay filter after pressing in the hydraulic press.

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8. The filter is removed very carefully. Again, it is of utmost importance not to handle it from the sides, but to lift the filter with both hands at the bottom making use of the plywood bat and move it to a rotating stand where it can be smoothed. Any filter that has been handled from the sides, or is altered in any way is discarded. In this workshop, the folds in the clay from the plastic are smoothed out using a knife or broken hacksaw. This is kept to a minimum. At this point each filter is stamped with the factory name its serial number.

9. After smoothing out, the filters are placed on drying racks. The filters are then left uncovered to air dry until they are ready to be fired(they must be completely dry). Some of these plastic covered filters can be seen in the photos.

These are shots of Filtron's kiln, showing the details of the firebox, and kiln floor showing the air intakes and outlets.

The bottom photo shows the water filters being stacked in the kiln. 50 filters can fit in the kiln.

A lot can be written about the intricacies of firing the kilns, and it isn't within the scope of this document to provide this level of detail. The filters are fired for 8 to 9 hours and the next morning portions of the kiln door are removed. The kiln door consists of stacked bricks, so that three rows of the bricks can be removed to start the cooling process.

10. After another 8 hours of cooling, the water filters are removed and put into a water tank to soak overnight. Filters remain in the tank until all air bubbles are removed. This can be confirmed by gently knocking the filters in the water to see if air bubbles rise to the surface. If so, they are allowed to remain in the water tank. The purpose of soaking the water filters is to be able to run the flow rate tests. The photo below shows a filter resting on a ceramic collar (which has also been soaking in the water tank). The filter is put on the collar to raise its bottom from the plastic tray which will collect all the water. The bottom of the filter is thereby unobstructed. The flow rate of all filters is timed and recorded on the rim of the filter.

11. After the filtration rate is confirmed acceptable for each filter, the colloidal silver solution is prepared. 300 cc of filtered water is mixed with 1 cc of 3.2 % colloidal silver. With a clean brush, this solution is painted on each fired filter. The areas where the colloidal silver solution have been painted are clearly visible, and every part of the filter is painted. The solution is mixed separately for each individua filter to ensure uniformity from filter to filter (it is then left to dry in the shade).

At this point the filter is finished. The destination and customer for each filter is carefully recorded and matched with the serial number at the time the filter order is confirmed. Prior to actually drinking the water from the filter, customers are advised to filter water two to three times. This ensures that the filter is working properly. A great deal of consumer education is required for the effective use of the filter. For example, if the filter is set on dirty ground, or comes in contact with any contaminated surface, it too will become contaminated. In PFP's experience, it is usually discovered that user error is to blame for the few "defective" filters reported.