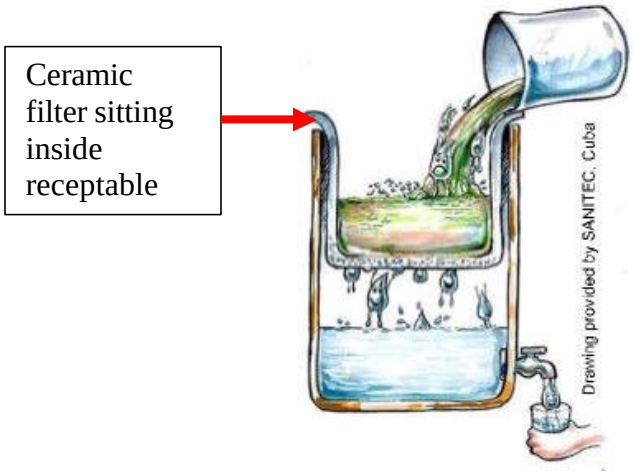
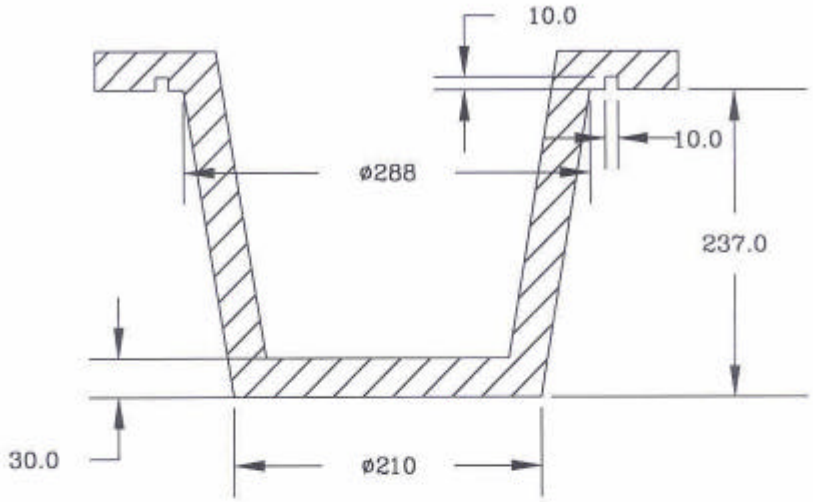
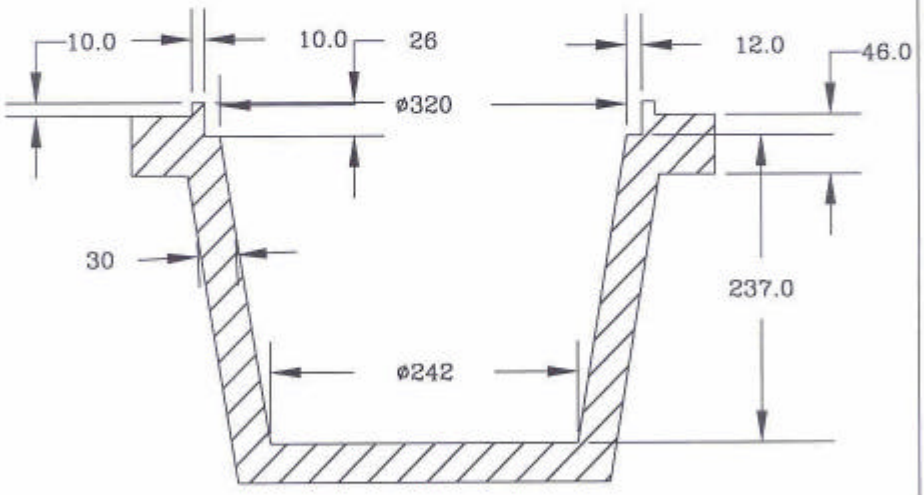
POTTER'S FOR PEACE (PFP) FILTER

The Potter's For Peace filter unit consists of three separate parts: 1) a porous clay filter medium, 2) a larger clay recipient canister (a plastic bucket can be substituted) and lid, and 3) a spigot attached to the bottom. The filter medium itself is 31 cm in diameter, 24 cm high, holds 7.1 liters of water, and is shaped like a coned flowerpot. The filter medium sits inside the receptacle like a vegetable steamer sits inside the steaming pot. The filter is coated with colloidal silver as a microbicide/disinfectant. This filter should offer a flowrate of 1 ¾ L/hr. (PFP website, 2001)



MALE PART





FEMALE PART

I. D. E. BANGLADESH.

DRAWN BY	M. HAQUE	APPROVED BY.	
CHECKED BY		QTY.	
MATERIAL		PARTS NAME	DRG NO.
SCALE		DICE OF W.FILTER	
DATE	9/2000		

Raw Materials Required

1. **Dry powder clay** (which can be obtained from the following sources)
    - Any clay available at the factory? "Depending on the clay's natural porosity, proportions of sawdust to clay will vary." (PFP website, 2001)
    - Pulverized? Grain size?
    - Brick clay (To better simulate local conditions and raw material. As in video, unwanted bricks are picked up from dump sites and manually mashed into fine grains.)
2. **Dry sawdust**
3. **Water**
4. **Filtered water** for dilution
5. **3.2% Colloidal Silver** (Microdyne) – 2ml per filter

Equipment Required

1. Screens
    - ? 25-35 mesh (larger)
    - ? 60 or 80 mesh (smaller)
2. (Mechanical mixer) – Not required if we just do the mixing manually.
3. (Potter's wheel/mold press) – Not required, if we just form the flower pot (or any shape) by hand.
4. **Buckets** for mixing (Prepare at least **2**)
5. **Temporary mold** e.g. **plastic pail** slightly smaller than lower receptacle – to simulate the actual dimensions of the PFP filter. (Or, as in video, we form the filter shape by hand in the bucket, which is used as the temporary mold ✍ filter shape is always smaller than the bucket)
6. Firing kiln*
7. **Brush** for colloidal silver application
8. **250ml beaker** to dilute colloidal silver
9. **Stirrer**

**Definitely require your neighbor's kiln.*
Are we able to find such screens? Does your neighbor's factory have those screens? Need to find out what the size numbers mean though.
Red and **Bold** – To be prepared before the trip to the kiln

MANUFACTURING PROCESS (Daniele's report, unless o.w. stated)
(Own comments are in *italics*.)

1. Dry pulverized clay e.g. bricks is mashed to fine grains (size not specified).
2. Dry sawdust is screened between a 35 mesh and a 60 mesh, keeping only what stays between the two screens. (Size of sawdust important.)
3. 1 bucket of dry pulverized clay (60%) mixed with 0.8 bucket of dry sawdust (40%), either manually or in a mixer.
   (PFP suggests 50-50% ratio as a starting point for the above components.)
4. Slowly add water while trying to wedge until you get to a consistency that you find workable.

Actual amount of water to be added is not specified. I guess that is not important, because "consistency" here should just mean "workability". As long as the mixture is not too dry or too wet to mould into shape, it should be fine.

5. "Throw them if you can." (CWFP, 1999) The filters are then formed by hand, turned on a potter's wheel, or press-molded. (See later for types of press mold)
   I have no idea what "throwing" means.
6. Make about 5 of them (in case they break).
7. Let them dry slowly and fire them when they are ready.
8. Filters are fired at 887?C degrees in a brick kiln. All battery of tests should be fired at the same cone. (Fuel source can come from wood scraps from industry.)
   "Try a few at cone 014 and then some at 010, etc. Keep in contact."
   I have no idea what this means, maybe the potter will know. I also need to know how long the filter has to be fired at this temperature.
9. Filters are allowed to cool.
   Any point from here onwards can be carried out back in MIT lab.
10. Filters are soaked for 24 hours to saturate the filter before flow testing.
11. The flow rate of each filter is tested. Measure the amount of water that seeped from the filter in one hour. Batteries of flowrate tests are run to determine adequate clay/burn material ratios. Ratios will differ for every clay deposit used. PFP design flowrate to be achieved is at least 1 ¾ L/hr.
    This sounds like a trial and error method. Since nature of clay (cetaris paribus) is highly variable depending on where the clay is obtained, different filter prototypes with varying clay:sawdust ratio are made to test for flowrates. Once the PFP design flowrate of 1 ¾ L/hr is achieved, the proportion of clay to sawdust is recorded and kept constant.
    ✍ *sawdust quality, size assumed to be constant. That is why the sieving process must be consistent.*
    ✍ *mold press pressure, water added also assumed to be kept constant.*
12. Filters are allowed to dry again.
13. 2 ml of 3.2 percent colloidal silver (Microdyne) in 250 ml of filtered water are applied with a brush to each filter.
    According to Daniele's PFP, 2/3 is applied to inner surface and the remaining 1/3 is applied to outside.
14. Filters are dried and prepared for sale or use.

"The PFP filter is currently sold for US$4.00 per filter to primarily NGOs interested in establishing their own water filtration program. Filters are sold without packaging or a finished water receptacle." (PFP website, 2001)

3 WAYS TO MAKE MOLD PRESS (FOR INFORMATION ONLY)

"One method PFP encourages to accentuate consistency is the use of a press mold for forming the filter unit." (PFP website, 2001)

This section is perhaps more useful when in Thimi, Nepal.

Source: Email from Ron Rivera, Nov 22, 2001

“Attached are three ways that these presses have been made (there are other designs also):

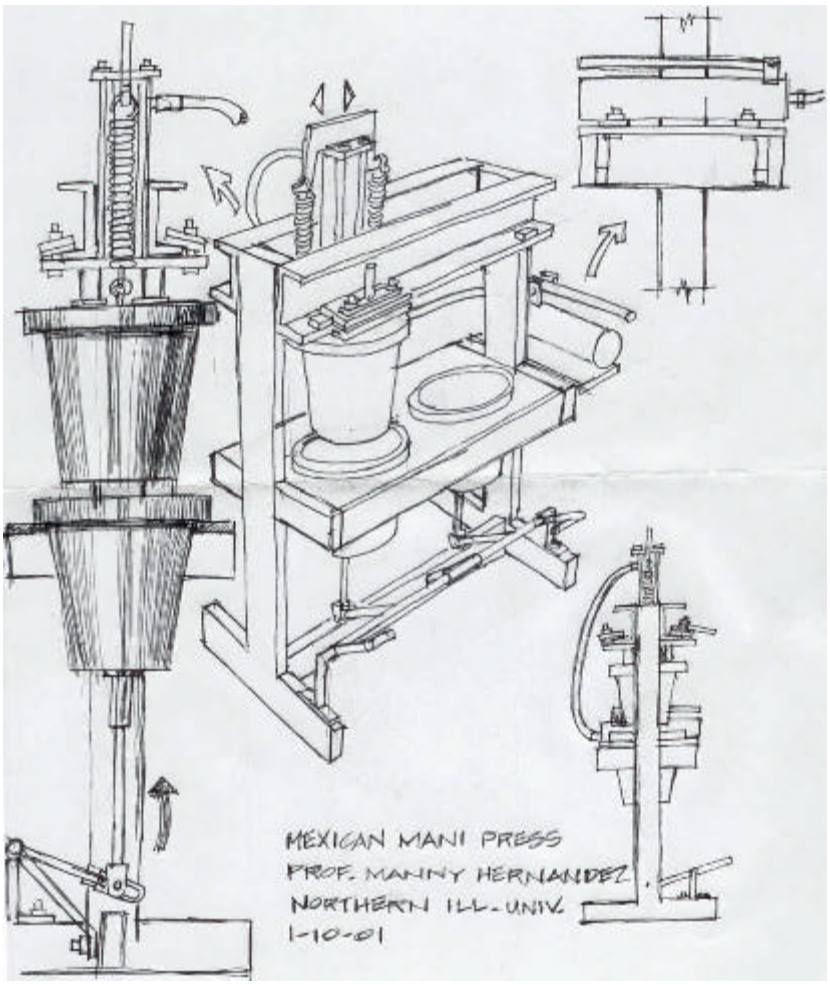
1) In Bangladesh (the red press) they actually made the alumi num molds at a local foundry, rented a large mechanics hydraulic press and started making prototypes, through trail and error based on a starting point of 50/50 clay and sawdust mix (in volume) and fired to about 860 degrees Centigrade they reached the correct filtration rate of 1 to 2 liters an hour. Danielle's research is going to tell us if that is the most appropriate rate but that's what we have been doing for 20 years.

Bangladesh Press

2) The screw press was developed in Cambodia and they two had an aluminum foundry make the 2 molds. It's a killer to use but it works. They report very positive microbiological test results. Hopefully they will soon sell enough filters to actually adapt he screw press to a hydraulic system.

Your potter will get a good laugh at this technology and probably have allot of questions, please tell him or her to contact me, Potters have a different language about technology.

3) In Chihuahua Mexico the Tahumara Indians we work with use this press, the biggest problem is that the hydraulics breaks down allot and it a takes a long time to fix it. I highly recommend the use of a 12 to 15 ton hydraulic truck jack found easily in every country in the world. It's pretty inexpensive, there are many mechanics that fix them, and they are very portable and designed to be reliable.”



Mexican Mani Press

TERAFIL TERRACOTTA FILTER

"We have already studied that the size of pores in well sintered terrafil are within 1 to 5 micron, and pores are not interconnected. A thin clay membrane (50-100 micron thickness) separating the pores..... The terrafil is prepared out of a mixture of silt clay(ordinary pottery clay), river sand ,wood saw dust and burnt at a higher temperature in a low cost kiln."

The above is the only limited information available from Surendra. I guess the manufacturing process should be similar to that of PFP, perhaps even simpler because there is no need to make a complicated mold (except pressure press into a filter cake). Notice the other possible difference is "river sand", which we could experiment or seek advice from the potters what kind of effect that will have on the filter.

Terafil Terracotta Filter Cake

Summary

- Raw materials and equipment to be prepared beforehand are highlighted in **Bold** above. I estimate that to produce one PFP like filter:
  - 1 bucket volume of pottery clay and sawdust each (they mostly come in bags)
  - 2 buckets
  - 1 smaller pail
  - (0.5 bottle of Microdyne colloidal silver)
  - (500ml of distilled water)

  The application of colloidal silver can be carried out back in MIT lab though.
- Considering the preparation, drying, firing, and learning times, it is estimated that it will be a full day job.