Construction, Installation, & Trouble-shooting
of
Kanchan Arsenic Filter (KAF)

Refresher Entrepreneurs Training on the Promotion
of
Kanchan Arsenic Filter in Nepal
December 19-20, 2004
@ Nepal Red Cross Society, Birgunj, Nepal

(revised January 30, 2005)

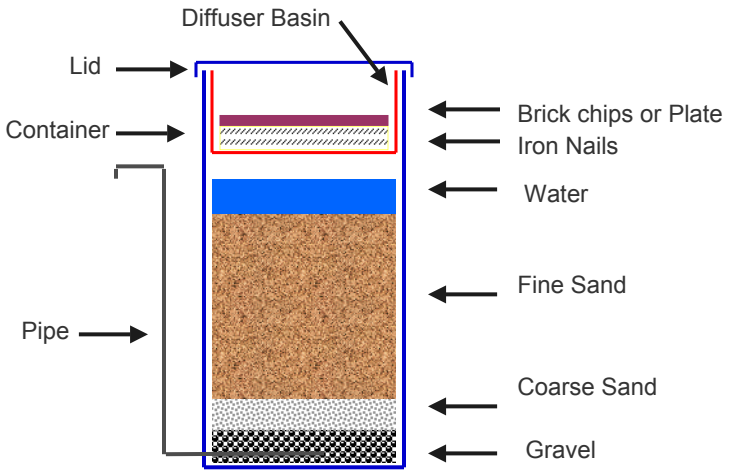
Tommy Ngai, Researcher, Massachusetts Institute of Technology
Bipin Dangol, Engineer, ENPHO

Presentation Outline

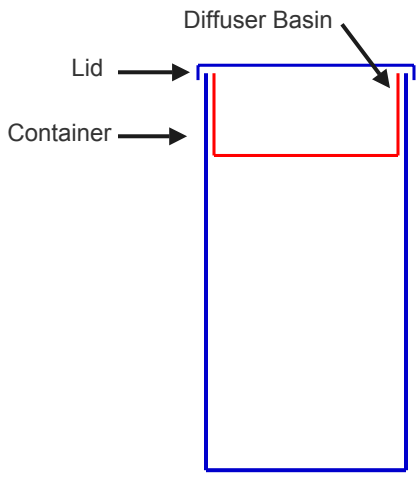
- Major Filter Components
- Filter Construction
- Filter Installation
- Trouble-shooting

Major Filter Components

Major Filter Components



Major Filter Components



Specifications:

Container & Lid
→ Gem model 505

Diffuser Basin
→ Gem model 1700

Major Filter Components

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Diffuser Basin
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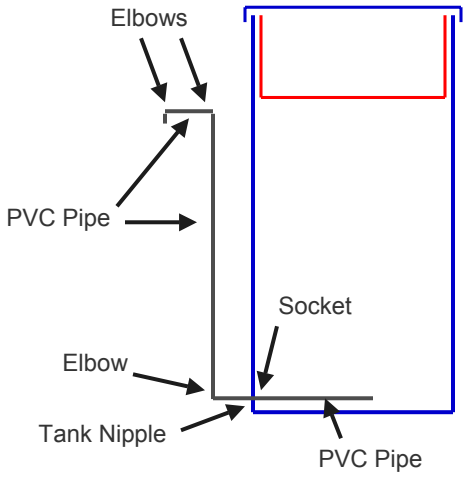
Major Filter Components

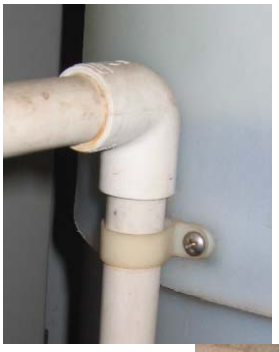


Specifications:

Pipe (PVC or GI)
→ ½ inch

Pipe fittings (PVC or GI)
→ 3 elbows
→ 1 tank nipple
→ 1 socket

Major Filter Components



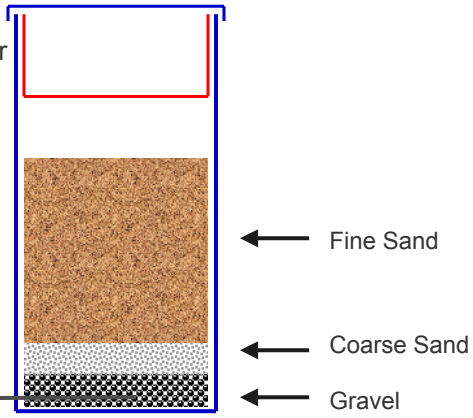
Major Filter Components

Specifications:

Fine Sand
→ 20 to 22 Liters
→ less than 1mm diameter

Coarse Sand
→ 4 Liters
→ 3 to 6 mm diameter

Gravel
→ 6 Liters
→ 6 to 15 mm diameter



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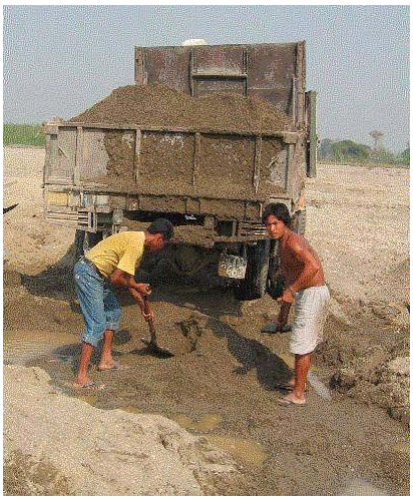
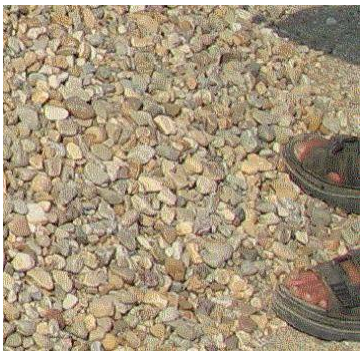


Sand and Gravel can be obtained from nearby rivers or crushers

Major Filter Components

Ideal gravel
– correct size, uniform size, clean with no silt, dirt, small particles or other visual contaminations



Poor gravel
– too big size, mixed up large and small sizes

Major Filter Components

Ideal coarse sand
- correct size, clean with no silt, dirt, small particles or other visual contaminations

Poor coarse sand
– non uniform size, mixed up with lots of dirt, silt, and fine sand

Major Filter Components

Ideal fine sand
- correct size, no large particles or visual contamination

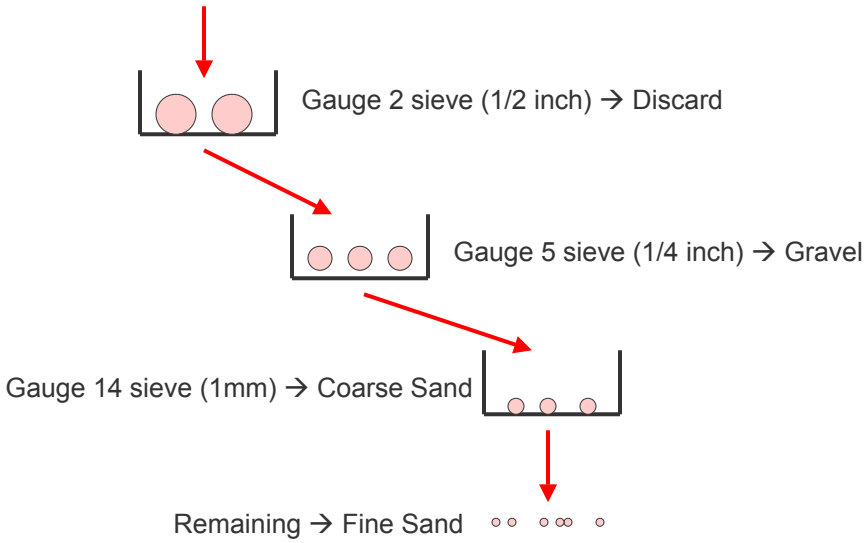
Poor fine sand
– non uniform size, mixed up with lots of dirt, silt, and large particles

Major Filter Components

Avoid sand/gravel sources with animal contamination

Use gauge 2 screen for gravel, gauge 5 for coarse sand, gauge 14 for fine sand

Major Filter Components



Major Filter Components

- Fine sand should be washed fairly clean.
- If sand is placed in a clear glass of water, and the sand is stirred, the suspended solids should be minimal.

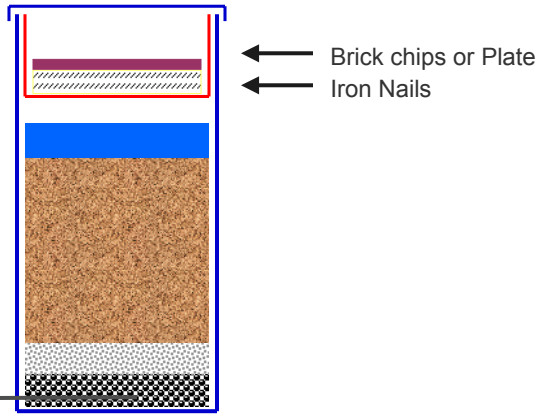
Major Filter Components

Specifications:

Iron nails
→ 5 kg
→ smallest size is best
→ length < 20mm
→ must be non-galvanized (must rust)

Brick chips
→ any brick is fine
→ about 5 to 10 cm diameter

Plate
→ any perforated plate that can protect the iron nails

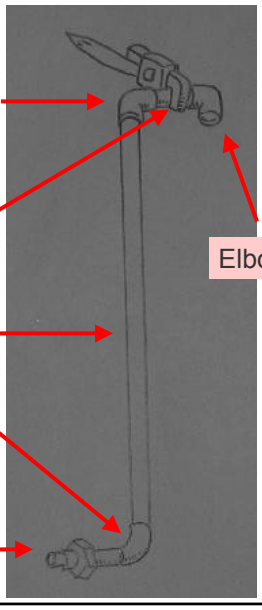


Major Filter Components

Choose the smallest, cheapest, non-galvanized iron nails from your local dealers. Buying in bulk to save money.

Filter Construction

Filter Construction



1. Measure and cut two pieces of PVC pipe (10 inches and 4 inches long)
2. Thread both ends of both PVC sections

Filter Construction

3. Attach elbows and tank nipple. Tighten the pipe fittings to the PVC pipe using a pair of wrenches (spanners)

Filter Construction

4. Pipes should be properly sealed with Teflon Tape and Glue to avoid leakage

Filter Construction

5. Make a fire to heat a ½ inch G.I. Pipe
6. Draw a line at 2 inches from the bottom of the Gem505. Puncture one hole below the line using the hot pipe

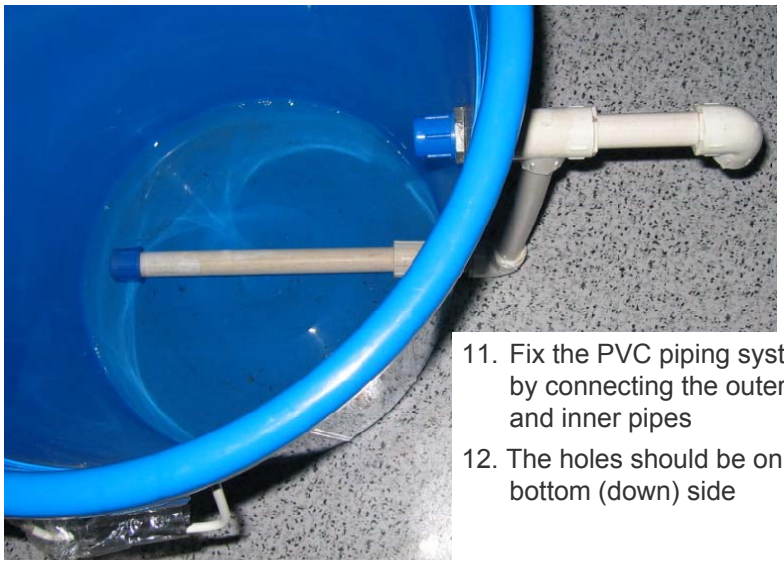
Filter Construction

Filter Construction

7. Measure and cut a PVC pipe 8 inches long
8. Seal one end of the PVC pipe with a cap
9. Connect the PVC pipe to a socket

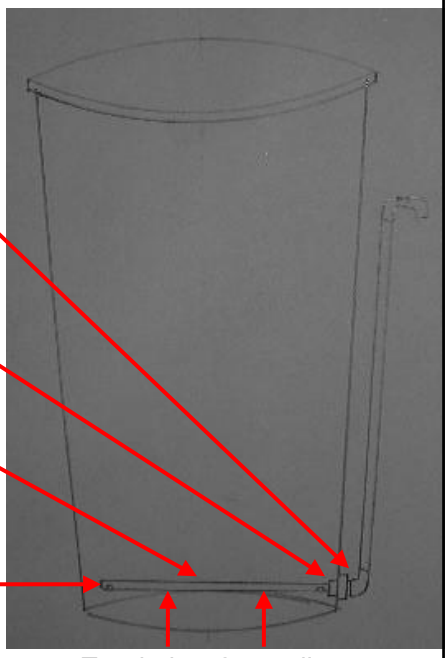
10. Drill two holes on PVC pipe (at location 2 inches from the sealed end, and at 2 inches from open end), using a hot bicycle spike/rod.

Filter Construction



11. Fix the PVC piping system by connecting the outer and inner pipes
12. The holes should be on the bottom (down) side

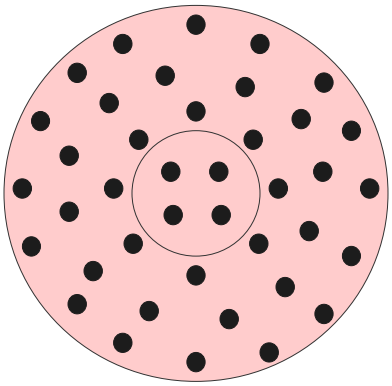
Filter Construction



Filter Construction

13. Heat bicycle wheel rod.
14. Puncture holes on the bottom side of basin

40 evenly distributed holes



Filter Construction

15. Fill up the container to full with water
16. Visually check for leakage from the outside
17. Check time needed to fill a 1L jug (Gem016). Time should be between 2 to 3 minutes.

Filter Construction

18. If time is less than 2 minutes (i.e. flow rate too fast), then
19. Use your fingers to close the two holes in the drainage pipe. There should be no flow
20. If there is no flow → the hole is too big. Need to make a new drainage pipe
21. If there is flow → check for leakage

Filter Construction

22. Check for leakage at the socket/ tank nipple connection
23. Tighten if necessary
24. Otherwise the filter construction is finished

Filter Installation

Filter Installation

1. Use bricks to prepare a flat surface. The surface must be very flat or the filter may become unstable and be broken

2. Put a thick layer (at least 3 cm) of mud and sand on the brick surface. This mud/sand layer should be flat.

3. Place the filter securely on the layer of mud and sand.

Filter Installation

4. Add two bottles of Piyush in 10 Liters of water.

5. Pour Piyush water into filter

6. Using a Gem016 jug (1 L capacity), measure 6 L of previously washed gravel.

7. Slowly add gravel to the filter. Flatten the gravel surface with your hand. The gravel should cover the entire drainage pipe. If not, then the drainage pipe was incorrectly setup. Either the hole in the Gem505 is at the wrong location, or the tank nipple was not tight enough. Secure the outer PVC pipe may also help to level (lower) the drainage pipe inside.

8. Using a Gem016 jug, measure 4 L of previously washed coarse sand.

9. Slowly add coarse sand to the filter. Make sure the interface is flat, and do not mix the gravel and sand

10. Using the Gem016 again, slowly add 5 L of water (non-Piyush) to the container. Do not disturb the sand and/or gravel layers.

Filter Installation

12. Slowly add fine sand to the filter. Make sure not to disturb/ mix the different media layers. Add until there is 5 cm of standing water.

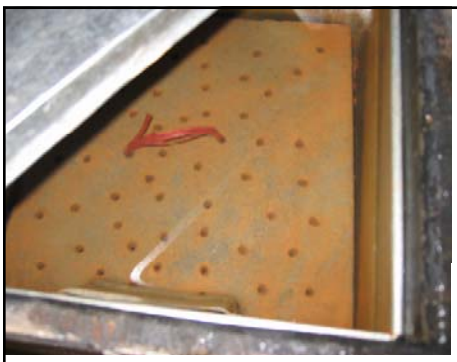
11. Measure about 20-22 L of previously washed fine sand.

Filter Installation

13. The water may appear little dirty with minimal foam. (as shown in left) This is fine. However, if there is too much foam (as shown below), then the fine sand has not been cleaned enough. The fine sand must be cleaned again, and the filter must be re-installed again.

Filter Installation

13. Put iron nails in the diffuser basin. Lay the nails flatly. Then add brick chips to cover the entire basin.



If iron nails is not protected, then arsenic removal efficiency will decrease as water passes through the basin without contact with iron nails.

Filter Installation

14. Cover with lid.
15. Wait for 48 hours for Piyush to disinfect the sand and gravel.
16. After 48 hours, perform filter maintenance, that is, to clean the top layer of sand according to maintenance procedure.

Filter Installation

17. Clean the top layer of sand until you get clear water

Filter Installation

18. Pour 50 L of water in the filter and discard the filtered water.
19. Now the filter is ready to be used

Trouble Shooting

Trouble-Shooting

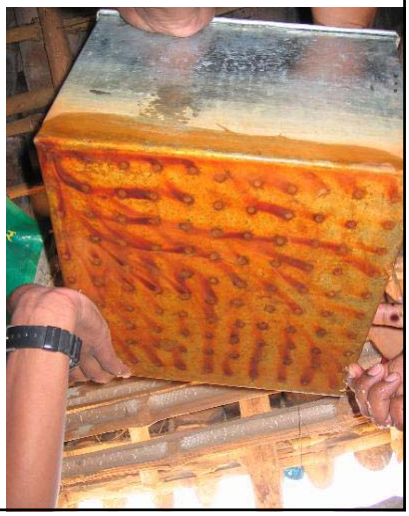
Problem No.1 - Too low flow rate (less than 5 Liters per hour)

1. Filter maintenance. Clean the top layer of sand. If doesn't work, then
2. Check clogging in the diffuser basin. Take the basin out and pour water into the basin. If basin clogs, then remove and wash iron nails and brick chip to clean out the dirt. Also wash the basin and clear out any holes that has been blocked by iron sludge/ dirt. If doesn't work, then
3. Remove all sand and gravel. Check for blockage in the pipe. Sieve sand and gravel. Re-install gravel and sand. Keep in mind that that there should be always water in the filter before adding gravel and/or sand to avoid trapped air bubbles. If doesn't work, then
4. Contact ENPHO. This is interesting. We also want to know why.

Top sand layer will clog. It is normal. It is because of the accumulation of dirt, dust, iron particles, and/or other contaminant particles.

Filter maintenance (i.e. cleaning the top layer of sand) can often return the flow rate to normal

Iron nails and/or brick chips can be very dirty. They must be washed to remove dirt and sand particles before placing into the diffuser basin



Remove the diffuser basin to check for clogging in the basin

Iron nails and/or brick chips were not washed prior to installation. Dirt from nails and/or brick clogs the holes in the diffuser basin.

Holes too small will get clogged easily.
Holes too large will allow iron nails to pass.
Proper size is necessary.

Trouble-Shooting

Problem No.2 – Gem505 container breakage

1. The filter should be placed on a flat, stable surface.
2. The filter should be placed indoors, away from the sun. Sun's UV ray may damage the plastic, making it fragile.
3. Be careful when making the hold in the Gem505 filter. Small crack near the hole may become a big crack, and eventually damage the container.

Trouble-Shooting

Problem No.3 – Leakage

1. If the leakage in on the outside pipe system, re-seal with Telfon tape and/or glue. If not, then
2. Check leakage at the bottom of the Gem505 container. There may be a crack. Seal with glue. Put the filter on a very flat surface with a 3cm layer of mud and sand. If not, then
3. Remove all sand and gravel. Check for seal for the entire piping system. Re-seal if necessary. The tank nipple rings may be jammed. Replace entire pipe or fitting parts if necessary. If doesn't work, then
4. Replacement of the plastic Gem505 container may be needed. If doesn't work, then
5. Contact ENPHO. This is interesting. We also want to know why.

Trouble-Shooting

Leakage is commonly found here. Possible reasons may include: Inadequate tightening of the tank nipple, tank nipple ring jammed, insufficient Telfon tape.

Trouble-Shooting

Due to the pressure of the sand and water, the bottom of the Gem505 container may crack. To prevent this problem, the filter must be placed on a very flat surface with a 3cm thick layer of sand and mud. This will help support the pressure of the sand and water.