AHD Nadi Filter

A Self Help Biological Sand Filter

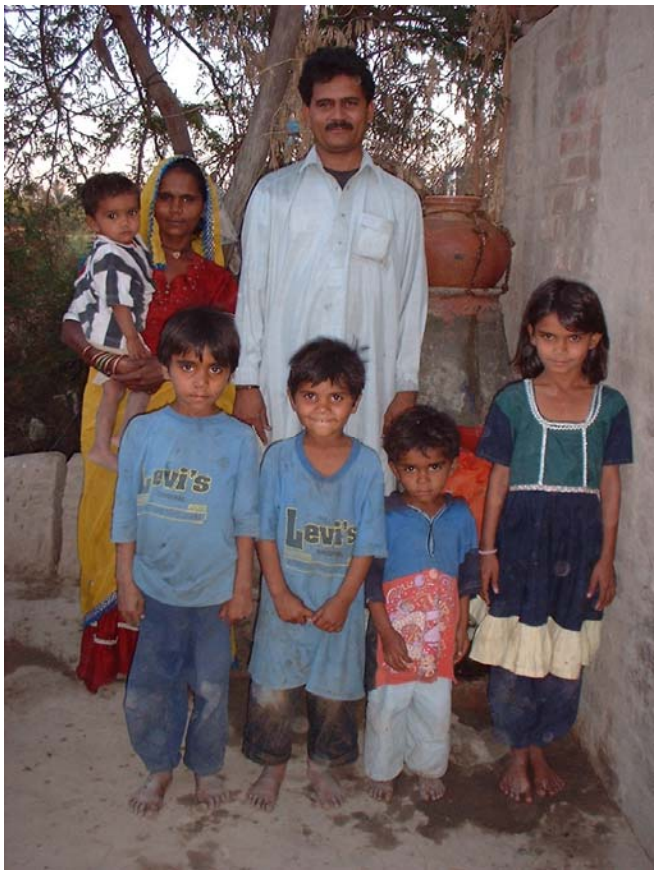
The approach to designing this filter was to look at water purification from a “no funds” perspective in the hope that development would be started that could sustain its self without funding or external intervention.

“All people need is the filters design details and the will to use it”

“God Created good bugs to eat the bad bugs”

In small numbers they are already present in all dirty water actively destroying the germs. They cost nothing and are freely available to all.

- ✓ Concept self promoting
- ✓ Simple Design
- ✓ Materials already available
- ✓ Filters easily maintainable
- ✓ Training self propagating
- ✓ Development Self financing



Therefore:

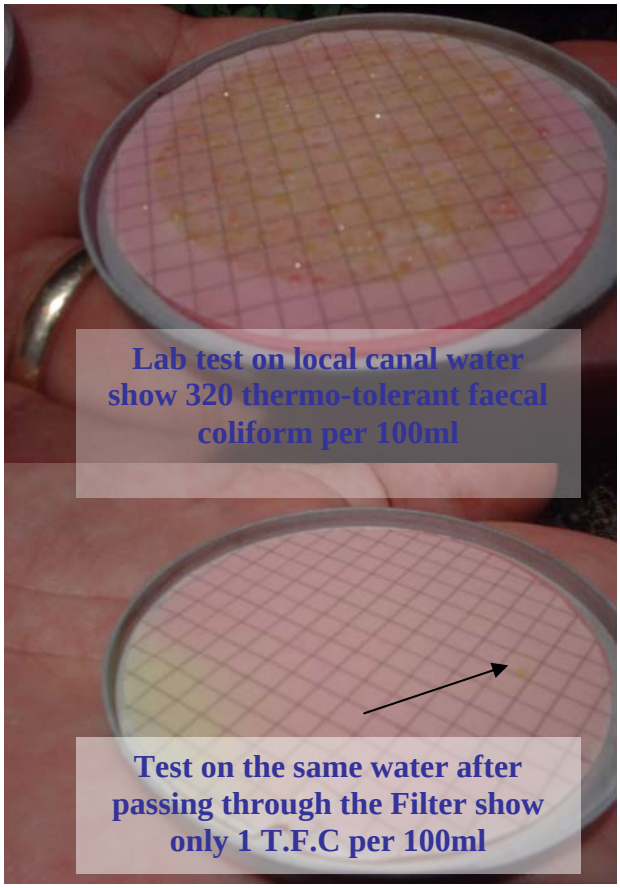
- No teachers needed
- No technicians needed
- No externally funded or imported materials needed
- No industrial manufacturing needed
- No funding or promotion needed

Once the filter has been successfully introduced into the target area, the majority of the implementation could continue on the basis bulleted above.

Performance and Zoology of the filter

"Good Microbes"

The active biology assembles its self in a series of layers. The uppermost is called the schmutzdecke.



This includes:

- threadlike algae
- plankton,
- protozoa
- bacteria

They effectively remove:

- **Parasites** including:
- Giardia
- cryptosporidium
- **Viruses** including
- faecal coliform
- cholera
- typhoid fever
- amoebic dysentery
- **Bacteria** including
- iron / sulphur bacteria (slimy deposits)
- **Chemicals** including:
- iron
- manganese (rust, stains, metallic tastes)
- hydrogen sulphide (rotten egg smell and other gases)
- toxins
- pesticides
- herbicides
- heavy metals (leads)
- **silt and sediments**
- **algae**

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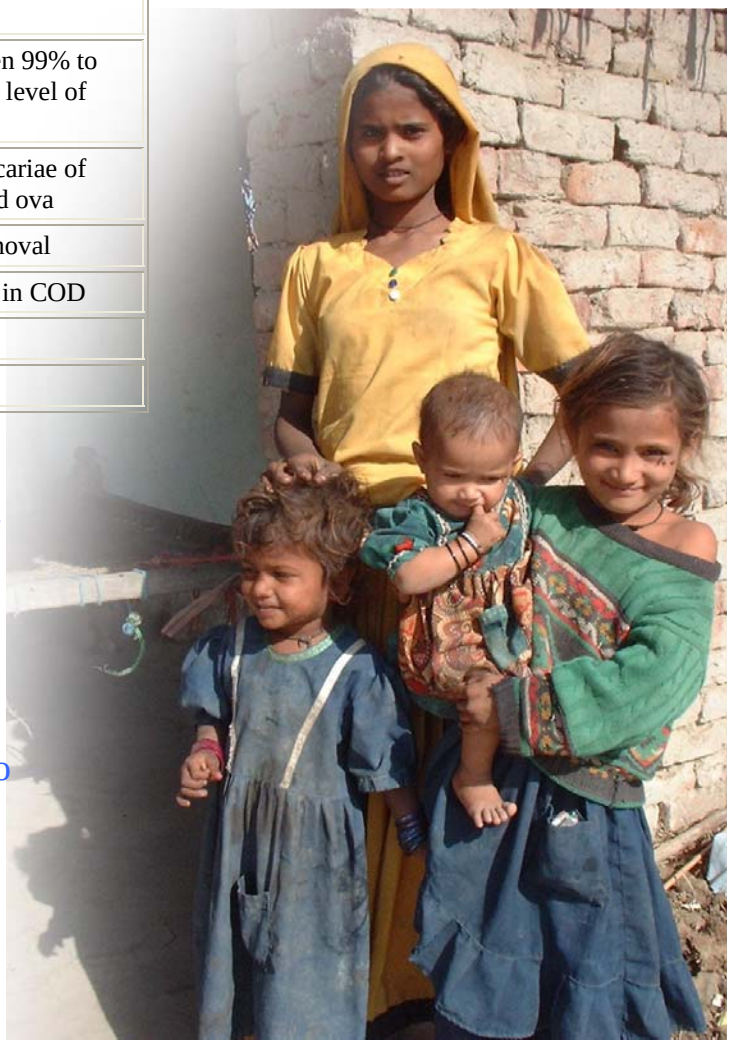
Performance of Slow Sand Filters.
taken from the Samaritan's Purse Website

Parameter of water quality	Purification effect of slow sand filtration
Colour	30% to 100% reduction
Turbidity	Turbidity is generally reduced to less than 1 NTU
Faecal coliforms	95% to 100%, and often 99% to 100%, reduction in the level of faecal coliforms
Cercariae	Virtual removal of cercariae of schistosomes, cysts and ova
Viruses	Virtually complete removal
Organic matter	60% to 75% reduction in COD
Iron and manganese	Largely removed
Heavy metals	30% to 95% reduction

The aim when designing the filter was for as many people as possible to have access to safe drinking water



More specifically it is hoped that the filter will be introduced as widely as possible within the capacity of our own organisation and that includes introducing it to other NGOs and people in a position to introduce it further.

The method is to give high quality “hands on” motivational training at village level, broadly across our target areas.

1. An invitation to the village is acquired

2. Motivational training is given which includes:
   - water and hygiene
   - how the filter works
   - how to make the filter

3. A filter is then made by the village people themselves under supervision.

4. The trainers leave once a filter is operating and can be explained, maintained and replicated by the people themselves.

Base Line Survey: No expense is required for a base line survey because it is broadly accepted that the filters provide clean water and that clean water results in improvements to health. The Base line is simply the fact that there are originally no filters being used. Progress can be assessed after a chosen period by randomly selecting villages in the target area and counting the number of functioning filters.

How the Nadi filter works

The filter is simply an optimised residence for the “good microbes” that eat up the microbes that cause diseases. The filter is designed to protect the good microbes in the sand which would be destroyed if the sand was allowed to be churned up or drained of water. They require a stable surface to live on with a constant supply of dirty water and oxygen to feed on. The sand in the filter provides an enormous surface area for them to live on and they multiply to fill this space. This takes two to three weeks to establish. In the mean time the water is far better than before even after a day or two.

Parallels of Bio sand filters

Good microbes capable of cleaning water are freely available to all as they occur naturally in dirty water. God mercifully created these organisms knowing that we would mess up our drinking water and need help to get it clean again. Sickness and poor quality of life, even death can result from not using these God given organisms. The filter was designed with this in mind.

The big difference is if people believe and accept God’s gift of the filter their lives will be improved.

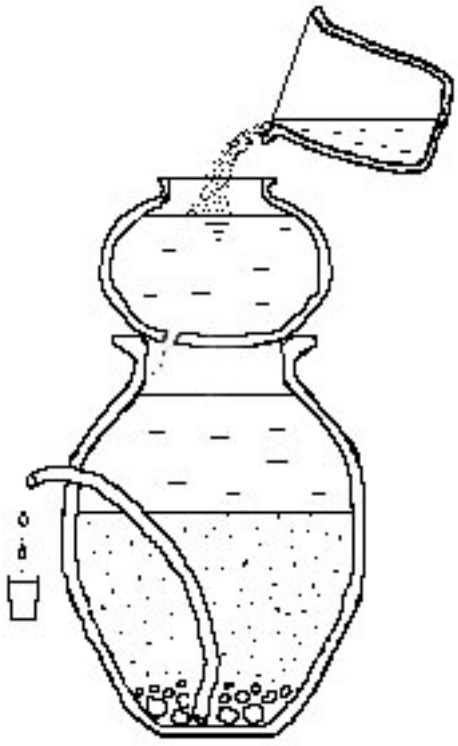
Nadi Filter Design Specifications

The nadi used for the filter must be 32 to 34 inches tall.

A hole is made for the pipe in the side of the nadi using a screwdriver and a suitable stone or hammer. The bottom of the hole must be 20 inches above the ground.

A single piece of stiff flexible pipe 30 inch long, 1 inch diameter and with no splits in it is fitted through the hole with one end inside the nadi touching the bottom. It is put in place and the hole around the pipe made water tight with cement.

A water storage pot for the filtered water must be chosen. If it is a nadi with a tap it should be put up high enough for jug to go under its tap. Put this clean water storage nadi on enough bricks to make this possible. The filter nadi can then be put in place on enough bricks for the protruding pipe to be just above the top of the storage nadi.



Potato size washed stones are placed in a single layer one stone deep at the bottom of the nadi. The gaps between them form channels for the water to flow easily into the pipe.

Small washed stones are placed on top filling the gaps between the potato size stones. Enough should be placed to prevent the next layer of gravel from falling through and blocking the gaps under the potato size stones or clogging up the pipe.

A thin layer of washed, dhal size gravel is then spread to form a level surface over the small stones.

A thin layer of washed seed size gravel in then spread to form a level surface over the dhal size gravel.

These drainage layers must not exceed 4 inches in total thickness or there will not be enough room for the main material, the sand.

Washed sand is then added to a level 5 inches below the level where the bottom of the pipe goes through the side of the nadi.

The mutca is taken and a single hole is drilled in it using a 3 or 4 inch nail with a right angle bend in it to form a handle. At first this is difficult work but after a few minutes the hole is made without the need to hit it through with a hammer. Most screw drivers make holes that are a bit too large so a nail is better. The hole should be on the bottom of the mutca about 4 inches to one side so as not to get blocked too frequently by debris settling in the mutca.

The mutca is then tied in place on top of the nadi with the hole in the mutca in line with the pipe coming out of the nadi. A stone is wedged between the mutca and nadi so that the hole in the mutca can be seen and it is easy to notice if the hole becomes blocked. String must be used to fix the mutca in place in order to protect the good microbes in the nadi from being disturbed.

A cloth is tied over the mouth of the clean water storage nadi in such a way that the cloth is over the protruding pipe. The water should not be flowing onto the cloth at all, as this would re-contaminate the clean water.

Once dirty water has been given to the nadi every day for two to three weeks the filter will function effectively so long as the sand is not disturbed. During this period the water will gradually improve. If the sand and stones were well washed, water can be improved a little by the filter even on the first day.

The nadi for storing clean water should be emptied every three days during this initial period while water quality is rapidly improving.

Pots for storing clean water should never be used for collecting dirty water.

When using a new nadi to make a filter it should be first checked for leaks which should be repaired using cement.

Never completely fill a new nadi or small cracks will develop. Only half fill it with water at first, then after two or three hours fill it completely and check for leaks.

If the filter gets too slow or stops working, remove the top few inches of sand from inside the nadi. Wash this sand with water in a bucket or bowl then put it back in the nadi. Make sure that the level of the sand in the nadi is restored to 5 inches below the bottom of the pipe where it comes through the side of the nadi.

When it becomes necessary to clean the sand in the filter it is good if there is another filter in the community that can be used for the two or three weeks it takes for the filter to build up its numbers of good microbes after being cleaned. Dirty water used for starting off a new or recently cleaned nadi can be put through the new one then through an established one if it is necessary to drink this water.

Project funding requirements

Trainer's wages
Transport for trainers (Big jeep)
Materials for training:
Nadi
Mutca
Sand
Cement
Mesh in three sizes
Mesh cutter
Screwdriver and hammer
Plastic pipe
String
Nails
Sacks
Stationary
Lights
Camera for record keeping
Office support staff costs
Senior staff supervision costs

Cost of making a Nadi Filter

32- 34 inch Nadi	120 Rs	-	200 Rs
*20 inch Nadi	100 Rs	-	120 Rs
Mutca	35 Rs	-	50 Rs
Sand	30 Rs	-	50 Rs
Pipe	30 RS	-	50 Rs

Cement	15 Rs	-	25 Rs
String	10 Rs	-	20 Rs
*Bricks	20 Rs	-	25 Rs
Total	360 Rs	-	540 Rs Typically 450 Rs

* Not essential

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