CAWST Technical Update

March 2007

The following list of recommendations for a biosand filter program is based on feedback from successful implementers in the field. If they are generally followed, it will ensure the highest probability of success in your biosand filter program.

Biosand Filter – Flow rate

Of particular interest to program implementers is a revision to the desired water flow rate from the concrete biosand filter. Based on recent field tests and recalculations of the loading rate, CAWST feels it prudent to reduce the maximum flow rate to **0.6 litre per minute** (or 100 seconds per litre) to improve filter efficiency and assure users of consistent results. Since flow rates are controlled by the screening and washing of sand, the sand should be washed less to achieve the reduced flow rate. In some instances, finer-grain sand may have to be sourced and used.

Three observations that convinced CAWST to change the recommended flow rate for biosand filters were:

- Inconsistent results from the field – especially in Haiti, from filters with higher flow rates;
- Comparison of the loading rates to that of conventional slow sand filters. The current recommended maximum of 0.6 litres per minute is still on the high side of recommended rates for slow sand filters, but the old flow rate of 1.0 litre per minute was at least 40% above that range; and
- CAWST's discovery of a suggested loading rate (600 liters/hour/m^2 of surface area) by the developer of the biosand filter and recalculation of the surface area and flow rate for the concrete version of the filter.

Note that the flow rate of 0.6 litres per minute is measured when the top reservoir of the filter is full of water. This will ensure that this is the maximum flow rate that the filter will experience since the flow will drop off as the water level drops.

Tips for a Successful Biosand Filter Program

A biosand filter program will be most successful when:

1. The filter is built and installed correctly:
    - box that doesn't leak,
    - screened and washed sand, (organic free, Uniformity Coefficient of 1.5 – 3.0 and an Effective size of 0.15 – 0.30 mm - a sieve analysis is required to determine these numbers)
    - well washed under-drain and separating gravel,
    - diffuser plate and lid

- safe storage container,
- maximum standing water level of 5 cms
- start-up (maturing) time of 14-21 days

2. The filter is operated correctly:
   - using water from the same source regularly
   - water supplied from shallow wells and surface waters will develop a faster and stronger biolayer
   - water from rain water and deep wells may result in less of a biolayer however the quality from these sources should be better
   - water containing VOC's, insecticides, herbicides, heavy metals, lead, mercury, industrial pollutants, algae, plankton, chlorine and salt should not be used in the filter
   - water with a turbidity of less than 100 NTU will still work with more frequently cleaning, water with a turbidity of < 50 NTU is preferred
   - maximum flow of 0.6 liters per minute when filter reservoir is full
   - pause period
   - intermittent cleaning to restore flow rate
   - proper "swirl and dump" cleaning process

3. Expected results under field conditions should be:
   - removal of turbidity to approximately 1 NTU
   - e. coli bacteria removal of > 95%
   - iron is removed
   - with adaptation of 5 kgs of iron nail, arsenic can be removed
   - Can not remove dissolved contaminants (salt, hardness - calcium, magnesium)
   - Can not guarantee pathogen free water

4. It is socially, culturally and economically accepted by the people it is intended to serve.

5. It is used in locations where no other water treatment exists or will not be forthcoming due to high costs or other technical reasons.

If you have questions about the above recommendations or feedback for CAWST, contact Ron Lentz, Director of Technology, at rlentz@cawst.org.