The HydrAid® BioSand Drinking Water Filter

THE HYDRAID BIOSAND FILTER

The HydrAid® BioSand Water Filter is a household drinking water filter for use in developing countries (Figure 1). The HydrAid® BSF filter is manufactured by Cascade Engineering. It is a lighter, plastic-housed version of the concrete BioSand Filter (BSF) invented by Dr. David Manz in the early 1990s. Both are intermittently operated, household-scale variations on slow sand filtration (SSF) technology that has been used to treat the drinking water of many European and American cities over the last 200 years.

Figure 1 – Cross-section of the HydrAid BSF. BSF is a biological filtration process in which the development of a microbial community enhances treatment.

Introduction of SSF to American cities in the early-20th century was the primary factor responsible for the massive declines in infant mortality and waterborne disease seen during the development transition of the United States.[1] There are many reasons why developing countries have not been successful in providing clean water through centralized treatment and distribution. However, the HydrAid® BSF has the potential to bring the same health gains seen in US cities to individuals and families in developing countries.

Studies undertaken in the numerous settings (Dominican Republic, Tanzania and Cambodia) have documented 40% or greater declines in diarrheal incidence when families use BSF.[2,3,4] But the greatest advantages of the BSF relative to other household drinking water treatment technologies are its rates of sustained-use, user-satisfaction and durability.[5,6] Over 85% of BSFs are reported to be in regular use up to eight years after installation.[4,7] The most likely explanations for the success and sustainability of BSF implementation relative to other technologies relate to the taste and smell of filtered water, lack of recurring costs, ease-of-use and reasonably high daily production volume.

Using the BSF leads to major health gains, but there is room for further improvement through changes in design. Under some operational conditions, reductions of bacteria and viruses in the BSF are not as high as in some other household treatment technologies.[5,8] That short-coming has been addressed with the addition of an inline chlorinator (Figure 2). To prevent the taste and odor problems associated with chlorine and decrease the likelihood of recontamination, a safe storage container with a dechlorination system have also been incorporated into the design.

Figure 2 – The HydrAid BSF with chlorinator and safe storage container. This storage container also incorporates a dechlorination device to prevent bad taste and odor.

ROTARY, UNC & CASCADE ENGINEERING

The Rotarian-led Children's Safe Water Alliance (CSWA) is responsible for funding 19,000 BSFs in the Dominican Republic (DR), providing sustainable access to safe water for about 100,000 people. Over 200 clubs in Michigan, Canada, the DR and throughout in the US and the Caribbean have supported the efforts of the CSWA and Rotary International has provided matching grants for 30 of these projects.

The Rotary clubs that formed CSWA have been instrumental not only in providing BSFs, but also in funding research to address critical questions about the health impact, performance and sustainability of the BSF. Professor Mark D. Sobsey from the University of North Carolina at Chapel Hill has led research on the concrete and HydrAid® BSFs. Although this research has yielded evidence that both BSF models can provide sustainable improvements in water quality and health, the concrete BSF simply cannot be manufactured and transported fast enough to reach everyone who needs safe water. The benefits of the BSF will not spread to the millions who lack safe water without mass production of filters that are lighter and easier to transport.

Cascade Engineering, a Michigan-based plastics company, has secured investment to scale up production and distribution of HydrAid® BSF filters. Distribution centers in the DR, Honduras and Ghana have been used to install about 25,000 filters to date. HydrAid® BSF filters have also been used for emergency response, with 1000 filters distributed in Haiti after the earthquake.

Rotarian Bob Hildreth was central in funding concrete BSF projects and establishing CSWA. Team member Jim Bodenner envisions reproducing the success of previous projects on a massive scale. Cascade has the capacity to manufacture up to 250,000 filters per year. By securing the capital investment and establishing distribution centers worldwide, Cascade Engineering is positioned to provide safe water to millions.

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