

Merits and Limitations of the Sawyer Filter, September 29, 2013

Below I have provided my input to you on the merits and limitations of the Sawyer Filter (as well as a few opinions):

Merits of the Sawyer filter:

- It follows the dialysis technology (blood filtration for kidney failure patients) and so it is manufactured hollow tubes of a specified absolute inside diameter (PointONE filter: 0.1 microns or the PointZero Two filter: 0.02 microns)
- The filter itself is light-weight and small though the container (5 gallon bucket usually) is more bulky though they can be stacked for transport.
- The flow rate of the PointONE filter is stated as 1 litre per minute. I did not find a similar value for the Point Zero Two filter only that it was " *the highest level of filtration available today.*"
- There is a high degree of probability that the Sawyer PointONE filter will remove bacteria, protozoa and helminths. There is a good probability that the PointZero Two filter will remove viruses as well (tube size is 5 times smaller than the PointONE). This is based purely on the inside diameter being small enough to block the pathogens. The virus removal is somewhat questionable as viruses are much more varied in size and testing has not been performed on all possible viruses.
- Practitioners who are implementing the Sawyer filter need only to purchase and import the filter into a developing country, purchase the container to attach the filter into, then train the people on the use and cleaning/ maintenance of the filter.

Limitations of the Sawyer filter:

- This is a plastic product that must be manufactured in a highly controlled process. It is made in the US then shipped into the developing country. Since the local people have no ability to build it for themselves, they will continue to be in a dependency situation for their drinking water treatment needs.
- Since the Sawyer filter is simply imported there is no 'ownership' by the community of the technology.
- The cost of the PointONE filter is US\$ 60 and for the PointZero Two filter US\$ 145 before tax and before customs and shipping costs. This is far more than the approx. US\$ 30 to build a biosand filter, for example. Both technologies require training of the households on the use and cleaning/maintenance of the filter.
- Customs duty must be paid to ship the Sawyer filter into a developing country. This can increase the cost considerably as plastic goods tend to have high customs duty in many developing country. Sawyer will not provide any assistance to ship the filters. They state that they will not even provide proper documentation; "*We do not and can not provide the proper document service that is needed for export.*"- from FAQ on Sawyer website. Customs can be difficult (in Haiti the customs agents are called the 'customs bandits'). In Kenya, MAP International reported Customs as a challenge; "*Customs clearance has been a serious problem in Kenya and delayed the availability of the water filters considerably besides adding a great amount to the cost (we had to pay custom*

duty as a commercial product- even though we had all the necessary documentation for it being a special donation for Humanitarian purposes)."

- Filtration rates drop off quickly with turbid water – frequent cleaning is needed (after as little as 40 litres). In the Sawyer website under FAQ: ***Do you recommend pre-filtering the water? Yes, and we have three recommendations for pre-filtration...***
- Durability / life expectancy is unknown - syringe and filter body are made of plastic. Sawyer has published no data on this nor were we able to find any independent studies [that is, independent of the organization that distributed the filters]. Also, the filter has only been available for a few years so their claim that the filters will last over a decade without being replaced seems unjustified – since they have not been distributing the filters for near that many years.
- Plugging of filter media is the single most difficult aspect of any filtration device. Backwashing is unlikely to be 100% effective meaning that clogging particles will accumulate in the Sawyer filter tubes which will reduce flow to the point where the filter is too slow for practical use at which time it will need to be discarded. This means that a supply chain must be in place to allow repurchase of the filters and components such as the syringe and tubing which are critical to the cleaning and use of the filter.
- The PointZero Two filter must be used for virus removal. The PointONE filter will not remove viruses. Viruses are estimated to cause 40% of diarrheal disease (Ramani and Kang, 2009). Rotavirus, hepatitis and other virus infections are often fatal to children under the age of 5 years. In the Sawyer website under FAQ it states; ***Do I need the pointONE Filter™ or the PointZERO TWO Purifier™? To play it safe you can always take the pointZERO TWO purifier, but people in their natural environments typically only need bacterial protection because they build up immunity overtime to the viruses they have been exposed to.*** “ This is disingenuous – children under 5, which account for 90% of the mortality from water-borne disease, do not have a developed immunity system – the viruses that they are exposed to can kill them before they can build up *“an immunity system overtime”*. Studies by the University of Illinois (Bradley et al, 2011) and the University of North Carolina (Elliot et al, 2011) have found that the biosand filter can reach 99.99% removal of viruses once deep bed maturation in the filtration sand takes place (200 days). The biological processes of the biosand filter allow increasing amount of virus removal with time whereas the purely mechanical straining of the hollow tube technology used in the Sawyer filter will provide no virus removal in the PointONE filter. The Point Zero Two filter cost, its reduced filtration rate, and the more frequent clogging has made this filter less than feasible for distribution in developing countries.

Opinions:

- Sawyer is a for-profit American company that develops and sells outdoor gear. They are aggressive in their claims about their products and they make some false claims about competing technologies.
- The PointONE filter will not remove virus and the PointZero Two filter is not feasible for developing countries, so any organization must realize that roughly 40% of the disease burden will remain in the water.

- The kidney dialysis technology is highly effective and I'm glad that it is available to 'main stream' people in the form of water filters. The Sawyer Squeeze Filter for outdoor travel is convenient for water treatment. I think it would be great as a light-weight, occasional-use device. For disaster relief it would also make sense to distribute Sawyer filters to make drinking water safer until permanent infrastructure can be re-established. However as a long-term water treatment device for remote rural areas where there is no supply chain and no one to pay for the replacement filter when the donated one clogs or breaks, I think it would be unsuitable.

Please contact me at dbaker@cawst.org if you have any further questions.

Kind regards,
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