

Water Treatment Technology Selection Guide

August 21, 2011

Abstract

We need a technology selection flow chart to guide communities, development workers and government officials to carefully and correctly select treatment systems that will produce safe drinking water. World Health Organization has some information on this, but it is dated and doesn't include the AguaClara technologies. The guide should take relevant water quality information and whatever else is needed to make an intelligent decision. Eventually this would work for both community based and household based water treatment options, however, our immediate goal is to provide expert guidance for selection of community based water treatment.

students 2

skills creativity, big picture perspective, CEE 4540

1 Introduction

There is widespread confusion about the major risks associated with drinking water supplies that is correlated a focus on the contaminant de jour. Thus it is easy to conclude that heavy metals or disinfection by products are the primary contaminants of concern for drinking water supplies when the largest health risk by far is from pathogens. Another common misperception is that filters are the answer for all sorts of contaminants and that activated carbon or charcoal is an ideal filter media. As part of the promotion of sustainable engineering practices it is important that we provide clear explanations and guidelines for the selection of the best drinking water treatment technologies. It is important that communities understand the process of selecting a water treatment process and that we define clearly what the benefits and limitations are for each option.

The technology selection guide should provide guidance on critical data requirements for intelligent decision making. The data requirements should be minimized and a simple depth of visibility option should be provided if turbidity data is unavailable.

The development of a technology selection guide should begin with a search for the state of the art guides that have been published. The guidance that we

provide needs to be very specific, detailed, and easy for a layperson to understand. We could also provide key questions for laypersons to ask technology promoters.

The format of the technology selection guide is not yet defined. The guide must be easily accessible globally and thus it must be available on the internet. It could be a printable form or it could be an online expert tool that asks questions based on the answers received. In any case the guide should be very visual with graphics that clearly illustrate the key concepts. The guide should detail the steps for acquiring the water treatment systems.

2 Guide Inputs

- Water source (surface water, spring, well)
- Turbidity (how many data points do they need?) We need to determine what the break points for different technologies are.
- Access to chemicals (note that the capital costs will be a lot lower if they can use chemicals).
- Population to be served
- Flow rate available in the dry season
- Is water in short supply in the dry season or is there excess water available? This determines how careful we need to be about not wasting water.

The flow chart should be codified and web-based. We need to determine if there are any instances in which multiple stage filtration is better than AguaClara. Multiple stage filtration is much more expensive to construct, but has the advantage of not requiring chemicals. It also can't handle high turbidity events as well.

We need an analysis of the turbidity level at which it makes sense to add the flocculation/sedimentation tanks in front of a stacked rapid sand filter (SRSF). If the raw water turbidity is never above about 50 NTU, then a SRSF might be a good option (with a low dose of PACl). Pretreatment with flocculation/sedimentation would reduce the wasting of water through backwash and thus the availability of excess water and the relationship between water availability and turbidity (rain and turbidity are correlated) could be included as inputs to the recommendation.

3 User Interface

The technology selection guide should be built in an environment that makes it easy to serve multiple languages and that operates in a web browser using a thin client (no large downloads required). The user interface needs to be intuitive to new users and needs to make it clear what inputs are required to make a useful decision.

During fall of 2011 we will begin developing a web based UI for obtaining AguaClara designs of both individual components as well as integrated designs of full water treatment plants. We have a license for NI LabVIEW Web UI Builder (tutorial) that could be used to create an expert system that would provide guidance on selecting the proper water treatment technology. It may be advantageous to couple the technology selection guide and the AguaClara Design Tool so that we can direct users of the guide to the appropriate technology for the cases when it is an AguaClara technology.