



Agua Clara Reach

Technical Overview

Municipal Drinking Water Treatment Simplified

AguaClara Reach provides global access to safe drinking water through capacity building with local implementation partners and the effective use of community-scale, gravity-powered AguaClara technology.

AguaClara technology was originally developed through a partnership between Cornell University and Agua Para el Pueblo. It requires zero electricity to remove turbidity from contaminated surface water sources and is scalable to fit the needs of many communities.

AguaClara plants currently provide safe drinking water to over 80,000 people in Central America.

Sustainable AguaClara Technology



NO ELECTRICITY or mechanization for low-cost, long-lifetime, and sustainable operation by local service providers

SIMPLE PARTS and materials for local empowerment

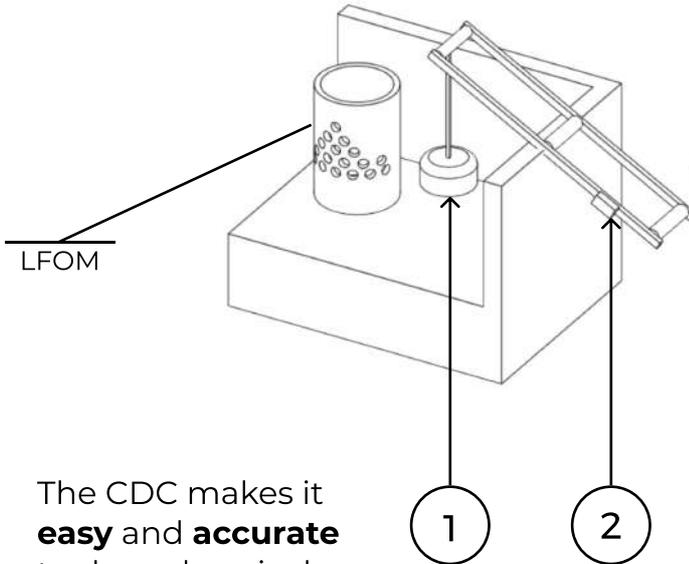
FEW MOVING PARTS as a result of innovative geometry and hydraulics, minimizing required maintenance

OPERATOR-FRIENDLY design

EFFICIENT removal of pathogens, particles, and some dissolved contaminants

Chemical Dose Controller (CDC)

The Linear Flow Orifice Meter (LFOM) creates a linear relationship between water level in the entrance tank and the flow out of the entrance tank. The drilled holes approximate the geometry of a suture weir.



The CDC makes it **easy** and **accurate** to dose chemicals. For any given plant flow rate, the slider can be adjusted to increase or decrease the amount of chemical flowing through the plant.

1 The float controls the height of the dosing tube, automatically adjusting flow rate.

SEMI-AUTOMATIC operation maintains dose set by operator even with varying plant flow

GRAVITY-POWERED design employs a novel approach to chemical dosing

SAFER granular calcium hypochlorite for disinfection, avoiding chlorine gas accidents

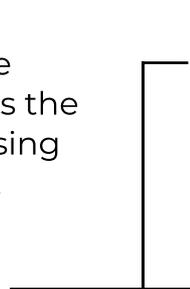
LOGICAL, in-view parts and plumbing, easy to adjust plant dosage needed based on influent turbidity

UNIVERSALLY available coagulant for coagulation/flocculation

AGUACLARA'S CHEMICAL DOSE CONTROLLER

is linearly controlled by the height of water in the entrance tank. This height creates the elevation difference needed to drive the chemical flow rate. This makes the entire coagulant/ chlorine dosing system reliant only on gravity.

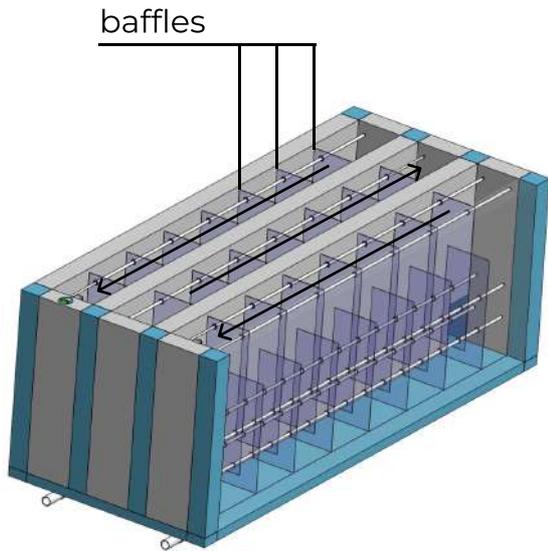
The elevation difference can change in two ways:



1 As the plant flow rate changes, it causes a linearly proportional change in the entrance tank water level that in turn changes the inclination of the lever arm by means of the attached float.

2 The operator slides the end of the dosing tube along the lever arm to adjust the dose.

Flocculation



FLOCCULATION is the process of aggregating the colloidal particles in raw water by first adding a chemical coagulant and then promoting collisions between particles by means of gentle mixing. The aggregates, called flocs, settle fast enough to be removed in the following clarification process

AGUACLARA FLOCCULATION FEATURES

NOVEL design approach based on the AguaClara hydraulic flocculation model allows higher efficiency and 1/3 the conventional flocculation tank volume.

SIMPLE structure with removable baffle modules and no moving parts.

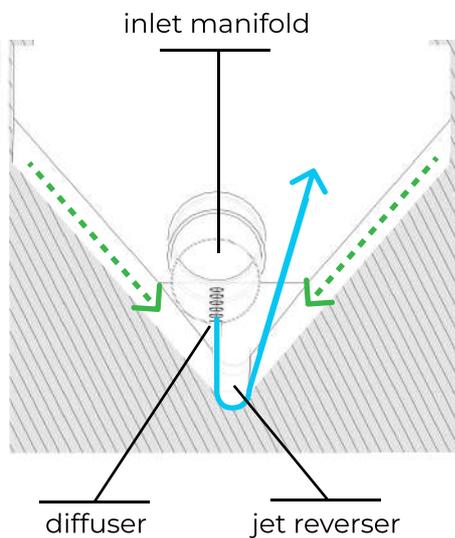
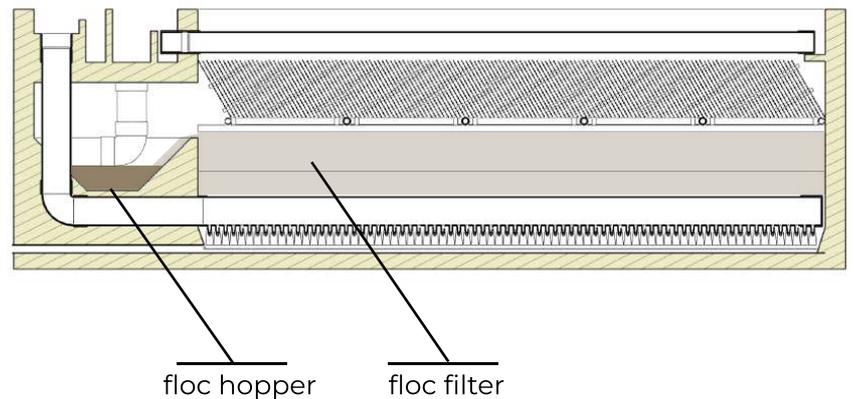
Baffle pairs are offset vertically in a pattern that alternates with gaps above the concrete slab and gaps at the top of the tank

These alternating gaps force flow around the tight turns, which causes water to deform and mix, colliding smaller flocs with each other to form larger flocs that settle faster.



Clarification

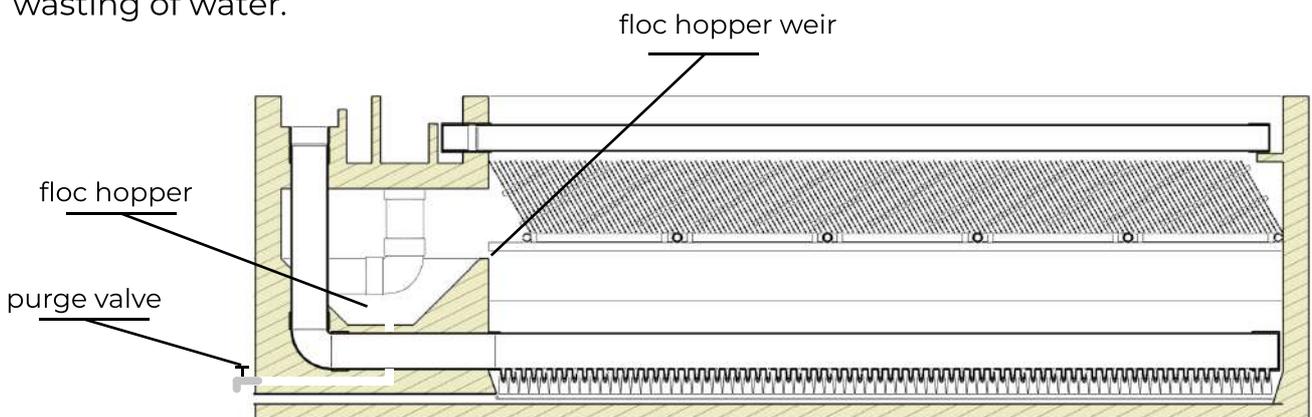
The **FLOC FILTER** is the first treatment process in the clarifier. The floc filter is a fluidized suspension of flocs in the bottom of the clarifier. The floc filter allows for a smaller flocculator, reduces the clarified water turbidity, and cleans the clarifier without any moving parts



Flocs slide down along the sloped bottom to the jet reverser. Water exits the inlet manifold through tapered diffusers at a high velocity. The curved bottom of the jet reverser re-directs the jet of water upwards, resuspending the flocs.

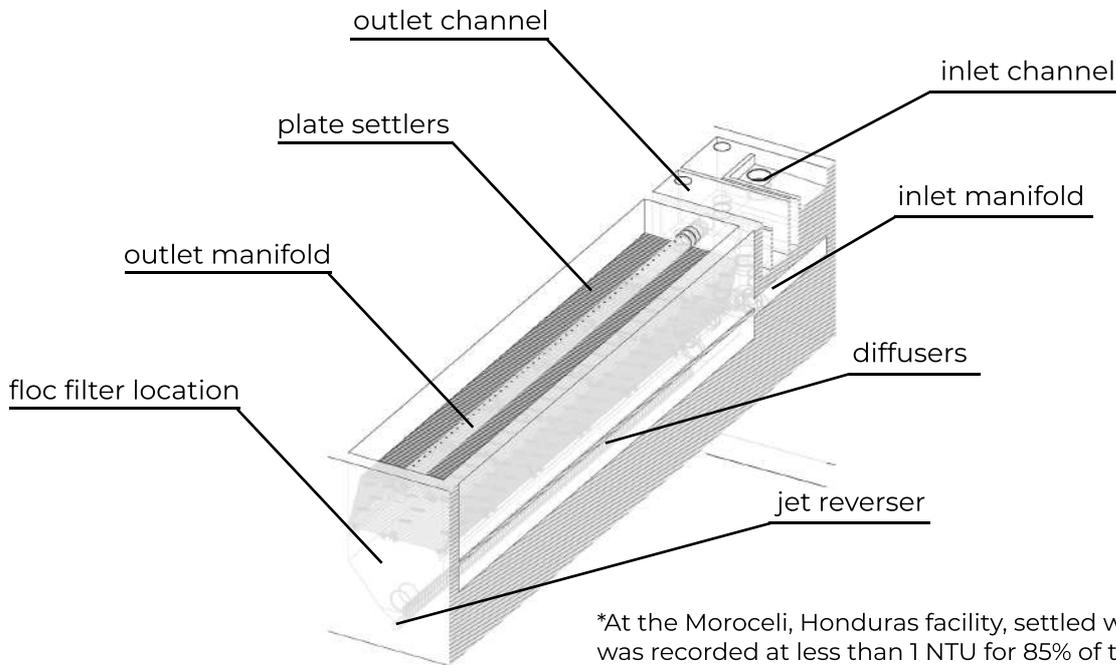
- Direction of falling flocs
- Direction of recirculating jet

FLOC HOPPER removes excess flocs and maintains the floc blanket at a constant depth. The height of the floc blanket is controlled by the floc hopper weir. As the floc blanket surpasses the weir elevation, flocs begin to collect in the hopper. When the hopper becomes full, the operator can open the valve to drain the flocs, purging them from the hopper. The concentrated floc hopper waste stream minimizes wasting of water.



Clarification

SEDIMENTATION is the process of using gravity to separate. This process, after flocculation and the floc filter, reduces the settled water turbidity to less than 1 NTU most of the time*. AguaClara clarifiers are less than 2 meters deep and have a residence time of less than 30 minutes.



*At the Moroceli, Honduras facility, settled water turbidity was recorded at less than 1 NTU for 85% of the time during a full year of operation.

NOVEL DESIGN IS SELF-CLEANING WITH NO MOVING PARTS

SELF CLEANING TANK uses an inlet jet of water, a jet reverser, and a sloped bottom to re-suspend all settled flocs. This maintains a stable floc filter that enhances removal of pathogens and small particles. Excess flocs spill into the floc hopper where they can be removed by opening a valve.

Our design uses low-cost, removable pipe stubs to isolate a clarifier bay for maintenance. This eliminates the need for expensive, large-diameter valves.



Stacked Rapid Sand Filter

RAPID SAND FILTRATION

passes settled water through a bed of sand to capture fine particles and pathogens. It is the final step in solids removal before disinfection.

AGUACLARA STACKED RAPID SAND FILTER FEATURES

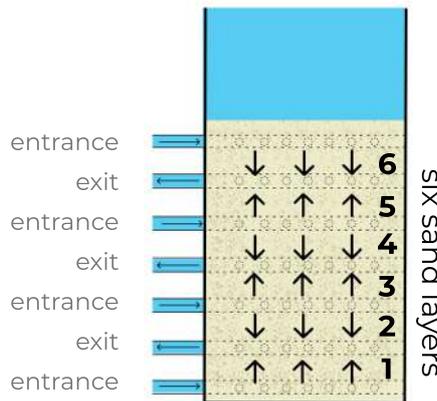
FRACTION of plan-view area needed compared to conventional rapid sand filters

SIPHON AIRLOCK for backwash outlet is operator-friendly and eliminates large valves

STACKED geometry allows simple backwash without pumps or filtered water storage

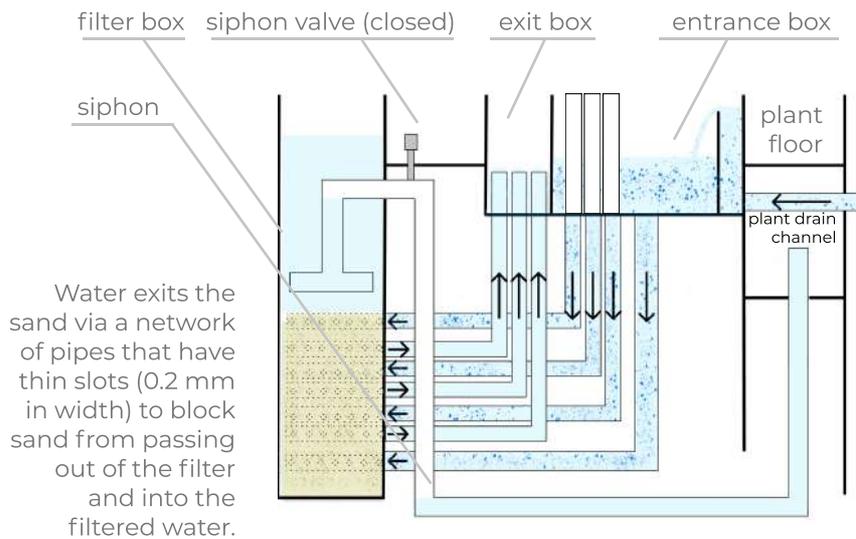
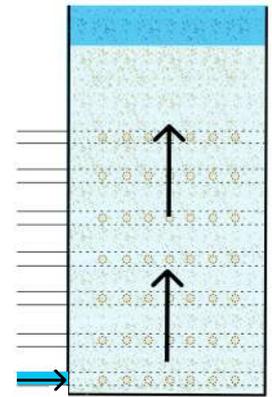
FILTRATION MODE

the flow divides between six layers of sand



BACKWASH MODE

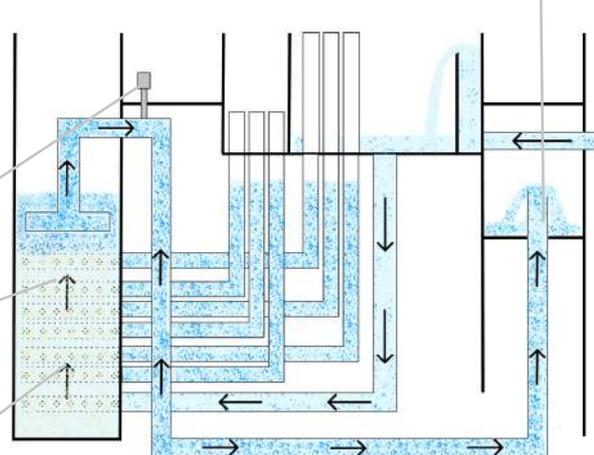
all of the water enters from below and passes through the sand in one direction, achieving the velocity needed to fluidize the sand



FILTRATION MODE

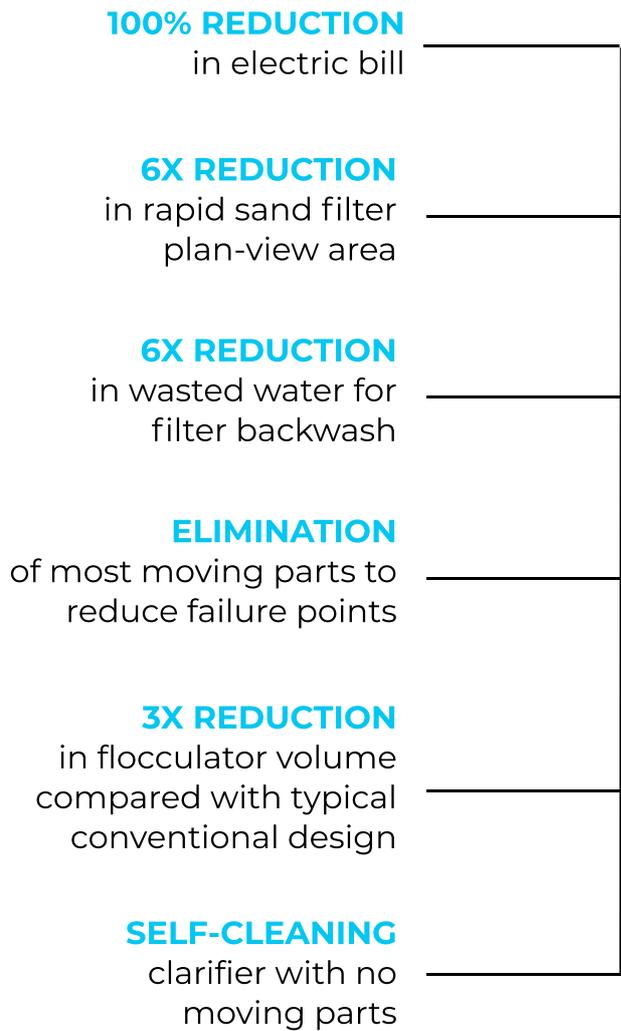
The siphon pipe controls the operating state of the filter by changing the water level in the filter box using only a small air valve.

fluidized sand
Water passes through the sand in one direction with high velocity.



BACKWASH MODE

The siphon pulls water from the filter to the outlet elevation.



What are the **QUANTITATIVE** benefits?

our technologies can achieve the same results as **conventional systems**

using less space, money, and energy

22 **municipal water treatment plants** in Central America and

4 **filtration-disinfection plants** in India

currently provide over

82,000

people with **safe drinking water**.

Visit our website at
aguaclarareach.org
or contact us at
info@aguaclarareach.org

More information can
be found in the
[AguaClara Textbook](#)

