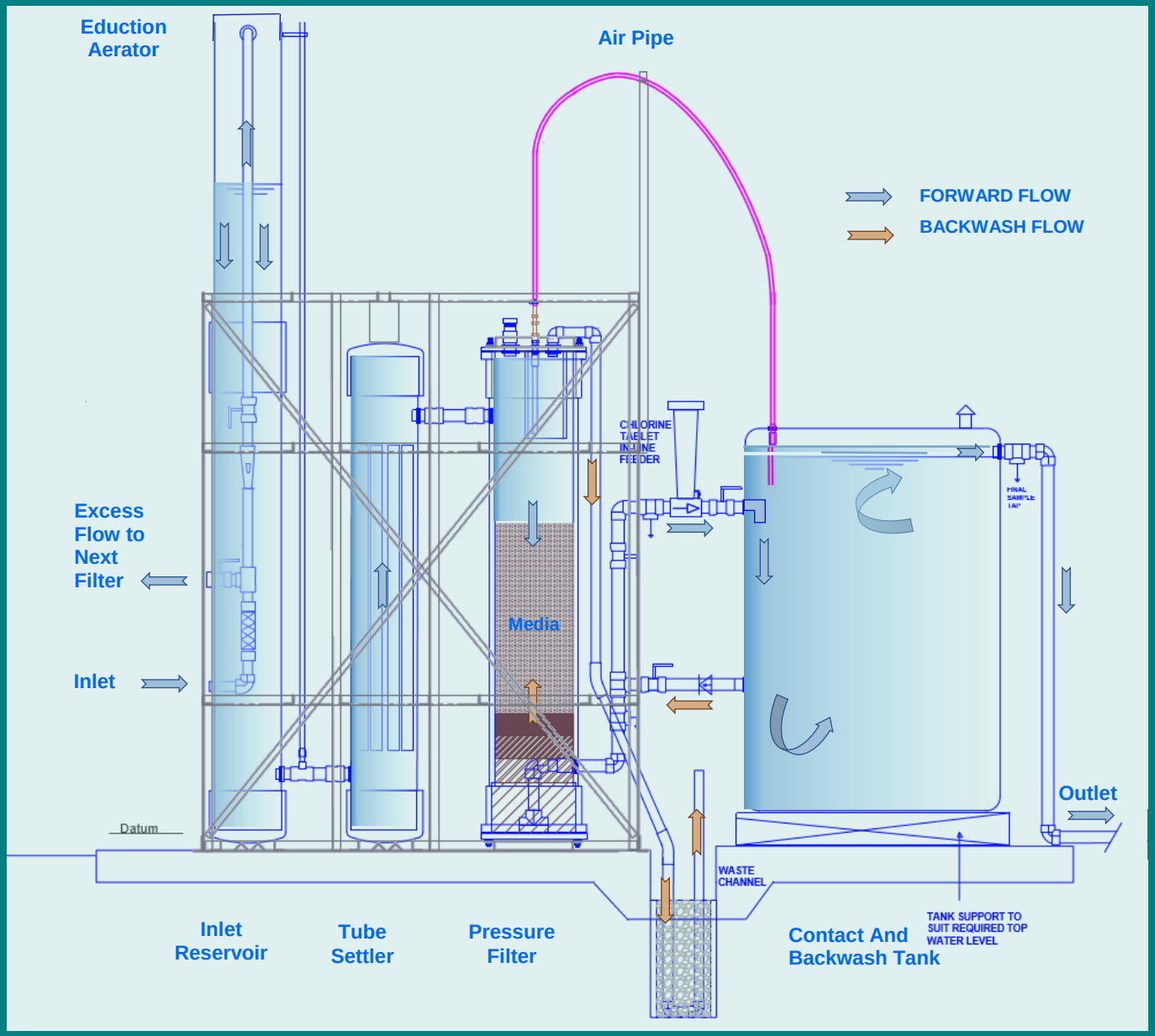
# ClariWash Self Washing Filtration System




- *Centralised water treatment for development & disaster response*
- *A single unit can supply ~ 1300 persons with 15l/ head/ day. Multiple units can be used*
- *Self-backwashing settler and filter*
- *No manual intervention required to achieve backwash. No moving parts*
- *No power supply or control system*
- *Low maintenance*
- *Made from pipes and tanks generally available in developing countries*
- *Can be made locally in a workshop, no manufacturing process is required*
- *Modular filtration unit for rapid deployment*
- *Unit can be moved manually by 4-5 persons*
- *System is replicable and scalable.*

*The system is early stage technology. It has however been tested on a university rig and 6 filters have been deployed and are supplying a community in western Uganda.*

# ClariWash Self Washing Filtration System - How it Works

**Target principles**:

No power supply or control system, no chemicals other than chlorine tablets, no manual intervention to backwash, low maintenance/ attendance, assembled locally in a workshop, able to deploy rapidly.

**Process comprises**:

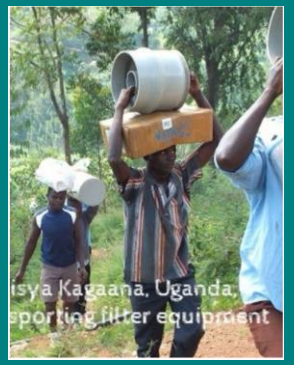
- Inlet zeta potential static mixer (ZPM) which reduces the repellent charge on particles allowing agglomeration to occur downstream. Some self-sterilisation may occur at this stage.
- Aeration at top of inlet reservoir to raise dissolved oxygen and precipitate dissolved iron etc.
- Inlet hydraulic reservoir which provides water for siphon priming and residence time for precipitation to occur.
- Tube settler which causes lamellar flow, increasing particle settling velocities. This should result in a settlement cloud developing in the transition zone between turbulent and lamellar flow in the tube settler. The cloud will intercept more particles reducing the load going forward onto the filter thus allowing more turbid water to be treated.
- Pressure filtration nominally at 10m/h but adjustable to suit water quality. Filtration media Dryden Aqua AFM Grade 0 for best water quality. Filter sand can also be used but less effective.
- Chlorine addition using chlorine tablets dispensed via an in-line feeder
- Disinfection contact time in contact/backwash tank before going to supply.

**Operation of system**:

- In forward flow mode, water flows through the system and produces treated water to supply.
- Progressively the filter clogs up with solids from the raw water. As this occurs, bed resistance increases and to compensate, the water level increases in the inlet reservoir which increases the driving head across the filter.
- As the pressure builds up in the filter, air is pushed from the top of the filter depressing the water level in the siphon tube.
- This process continues until the depressed water level reaches the bottom of the siphon U tube. At this point the water level in the inlet reservoir is at a maximum (terminal head-loss). The water columns exactly balance throughout.
- A further slight increase in head loss across the filter causes air bubbles to be pushed around the bottom of the U tube which reduces the weight of this water column slightly. This reduction causes a slight acceleration of water flow from the inlet reservoir causing more air bubbles to be pushed around the bottom of the U tube. The rate of increase quickly becomes exponential and all water in the U tube is jetted into the waste channel.
- As there is now no resistance, the water in the inlet reservoir flows rapidly over the siphon expelling all air and priming the siphon.
- Water from the inlet reservoir continues to flow over the siphon and the level reduces. During this phase the settlement cloud built up in the tube settler is flushed over the siphon to waste along with the incoming flow.
- As the water level in the inlet reservoir drops below the level of the top of the filter, negative pressure builds up in top of the filter due to the draw of the siphon.
- The negative pressure increases until a point is reached when the filter media expands allowing flow from the backwash tank to occur in reverse through the filter.

- The filter is now in backwashing mode for a given period to clean the media. This period is determined by the level of the air tube in the backwash tank.
- The level in the backwash tank drops to the bottom of the air pipe allowing atmospheric pressure to enter the top of the filter and break the siphon. Surplus air is drawn into the top of the filter to allow the priming function to re-occur on the next filter cycle.
- The incoming flow continues uninterrupted throughout. After the wash is complete, it first replenishes the backwash tank before flow to supply is restored.

University Test Rig




Six ClariWash filters installed in Western Uganda

WaterReach™

Solutions for Development and Disaster Response
www.waterreach.co.uk
nigel.heeler@waterreach.co.uk