

# In-Line Chlorinators for Water Treatment: Products and Studies (February 21, 2019)

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## Products

### Chlorine dosers (all do not require electricity)

\*Most products are commercially available, but some require contacting the company for pricing

- [Aquatabs Flo](#) (tablet doser, gravity fed, has been extensively [tested](#) in Dhaka, Bangladesh)
- **Aquatabs InLine** (venturi doser, pressurized, higher flow rate than the Flo)
- [ZIMBA](#) - batch chlorinator, extensively field tested in Bangladesh and India,
- **CTI-8** PVC tablet doser (self-constructed, instructions available online)
- [Dosatron](#) (water powered liquid dosing pump, Oxfam includes in their emergency response website; has been paired with WATA electrochlorinator in Nepal)
- [Horizon Pool Supply - Chlorine Tablet/Bromine Feeders](#)
- [Klorman tablet doser](#)
- [MiniDos](#) (and other similar water powered dosing pumps exist, not specifically designed for chlorine)
- **MSR Venturi** (co-developed by MSR, Stanford, and Tufts, venturi liquid chlorine doser, field [tested](#) in Kenya, early prototype described in this [video](#) for students)
- [National Discount Pool Supplies Chlorine Tablet Feeders](#)
- [Norweco BIO-DYNAMIC LF 1000 Chlorine Tablet Feeder Chlorinator](#)
- [Norweco Bio-Dynamic LF Series Tablet Feeders](#)
- [Pulsar 1 - Lincoln Aquatics](#) (solid tablets, expensive and designed for swimming pools)
- [PurAll tablet doser](#)
- [Septic Solutions - Chlorine Tablet Feeders for Aerobic Systems](#)
- [Water Mission International tablet chlorinator](#)
- [AguaClara Cornell](#) (community-level water treatment systems that include chlorine dosers)

### Chlorine makers

- [MSR SE200 Community Chlorine Maker](#)
- [WATA by Antenna](#) (range of chlorine makers available)
- Additional products available, not all listed here.

## Studies, listed by publication date

[Effectiveness of in-line chlorination in a developing world gravity-flow water supply](#). Waterlines, April 2017. The research suggests that an in-line PVC chlorinator can be a simple, effective technology that utilizes local materials to provide safe drinking water for rural communities; however, water committees need to iteratively test free chlorine residual in the system until sufficient residual is reached.

[Field trial of an automated batch chlorinator system at shared water points in an urban community of Dhaka, Bangladesh.](#) Journal of Water, Sanitation and Hygiene for Development, 2016. Point-of-use water treatment with chlorine is underutilized in low-income households. The Zimba, an automated batch chlorinator, requires no electricity or moving parts, and can be installed at shared water points with intermittent flow. We conducted a small-scale trial to assess the acceptability and quality of Zimba-treated municipal water.

[Sustained effectiveness of automatic chlorinators installed in community-scale water distribution systems during an emergency recovery project in Haiti.](#) Journal of Water, Sanitation and Hygiene for Development, 2016. Reasons why the chlorinator project did not achieve intended sustained effectiveness included: lack of accountability for infrastructure maintenance; lack of tablet access; and lack of effective community management systems. We recommend future implementers of centralized water treatment systems in relief-to-recovery contexts consider these three components necessary for sustainability.

[Differences in Field Effectiveness and Adoption between a Novel Automated Chlorination System and Household Manual Chlorination of Drinking Water in Dhaka, Bangladesh: A Randomized Controlled Trial.](#) PLoS One, March 2015. This study compares a novel low-cost technology designed to passively (automatically) dispense chlorine at shared handpumps with a household-level intervention providing water disinfection tablets (Aquatab), safe water storage containers, and behavior promotion. Aquatabs usage fell by 50% after behavioral promotion visits concluded, suggesting intensive promotion is necessary for sustained uptake. The study findings suggest high potential for an automated decentralized water treatment system to increase consistent access to clean water in low-income urban communities.

**Efficacy of Gravity-Fed Chlorination System for Community Scale Water Disinfection in Northern Ghana.** Daniel Cash Fitzpatrick. Masters Thesis, June 2008. This study compares the Pulsar 1 unit to the household treatment of the Kosim filter plus Aquatabs. The Kosim filter is a pot-shaped Potters for Peace-type ceramic water available in Northern Ghana, while Aquatabs are an alternate chlorine product comprised of sodium dichloroisocyanurate (NaDCC). Both the Pulsar 1 and Aquatabs systems were found to be technically feasible. The main two advantages of using the Pulsar system over Aquatabs are the vastly reduced operational costs (in \$/m<sup>3</sup>) of disinfection treatment (about 48 times cheaper) and its ability to reach an entire community (compared to just a single household). However, these benefits are gained as a tradeoff for increased system complexity and higher capital costs. Overall there is no “single best option”, which means site-specific circumstances should dictate the appropriate technology.

[A Comparison of Two Systems for Chlorinating Water in Rural Honduras.](#) J Health Popul Nutr September 2005. The results suggest that tablet feeders may be more effective than hypochlorinators in supplying clean water in rural, resource-poor settings and possibly serve as an alternative technology for water disinfection. Further research on techniques for empowering and building capacity within community water boards will help organize and introduce sustainable water systems in developing countries.

Chart from Tom Heath, generated from publications above.

Product	Type	Refill Frequency	Location	Observations	Cost
<a href="#">Zimba</a>	Automatic batch chlorinator, Hypochlorinator, consist of multiple tanks enclosed in a container that is secured at the outflow of a hand pump or tap (liquid chlorine)	Twice a week	Bangladesh	<ul style="list-style-type: none"> <li>· Over a 10-week period, the percentage of households with stored water with a safe level of free chlorine was 80% in treatment households</li> <li>· the average free residual in stored water was low (0.5 mg/L, SD <math>\frac{1}{4}</math> 0.5, range <math>\frac{1}{4}</math> 0.07–1.8 mg/L)</li> <li>· Required frequent visits from trained field staff to refill the dispensers</li> </ul>	Contact: <a href="mailto:firefly.powers@yahoo.com">firefly.powers@yahoo.com</a>
Bio-Dynamic Model LF 500 chlorinators	Automatic, gravity-fed tablet-feeders installed inline in a water system with intermittent or continuous flow (tablet)	Several weeks without requiring maintenance	Haiti	<ul style="list-style-type: none"> <li>· two years after project completion found 0% sustained use of the chlorinators due to lack of infrastructure accountability, tablet supply and effective community management systems</li> <li>· Also 83% of chlorinators were in operational condition, although water pressure was sufficient to operate chlorinators at only 56% of sites; 0% of chlorinator sites had tablet stock; and, while 86% of households reported using water from distribution systems with a chlorinator</li> </ul>	Not specified

Nirapad Pani, custom construction	Automatic in-line chlorinator. Relies on the suction created by each hand pump stroke to pull chlorine through an injection point in the pipe underneath of the handpump (liquid chlorine)	Once per week	Bangladesh	<ul style="list-style-type: none"> <li>Proportion of households whose stored drinking water had detectable total Chlorine was 75% for chlorinator (72% for control with aquatabs)</li> <li>Issues with chlorine reliability of doser</li> </ul>	Prototype \$23; not available for purchase
Local design based on Panama Ministry of Environmental Health's	Inline chlorinator for gravity systems (slow release chlorine tablet)	Once per week	Panama	<ul style="list-style-type: none"> <li>Did not achieve free chlorine residual above 0.27 mg/L</li> <li>Inconsistencies in tablet manufacturing affect standards</li> </ul>	\$35
Not specified	Hypochlorinators - inline reservoir of (granular chlorine)		Honduras (comparative study)	<ul style="list-style-type: none"> <li>Requires frequent maintenance by plumbers</li> <li>Granular chlorine is heavy and generally settles to the bottom of the hyperchlorinator</li> </ul>	
Not specified	slow release chlorine tablet)		Honduras (comparative study)	<ul style="list-style-type: none"> <li>Tablet feeders had significantly higher mean values for levels of residual chlorine (measured in ppm) than hypochlorinators</li> <li>tablet feeders were more likely to meet recommended standards than hypochlorinators</li> </ul>	