

Venturi In-line Chlorinator

Source Protection

Safe Transportation

Sedimentation

Filtration

Disinfection

Safe Storage

What is it?

This is a technology that doses untreated water with liquid chlorine, requires no electricity and can be attached to existing pipes. This system uses a special pipe section (a Venturi) to add a 1% liquid chlorine solution to the water. The Venturi works by narrowing the pipe to a smaller diameter where the water speeds up, and the pressure drops. This lower pressure pulls the chlorine into the water through a valve. The amount of chlorine added depends on how fast the water is flowing. If the water flow changes, the amount of chlorine added will change too. The water and chlorine flow rates can be adjusted using valves.

Performance

Microbiological effectiveness

The table below summarizes the disinfection effectiveness of chlorine when correctly dosing:

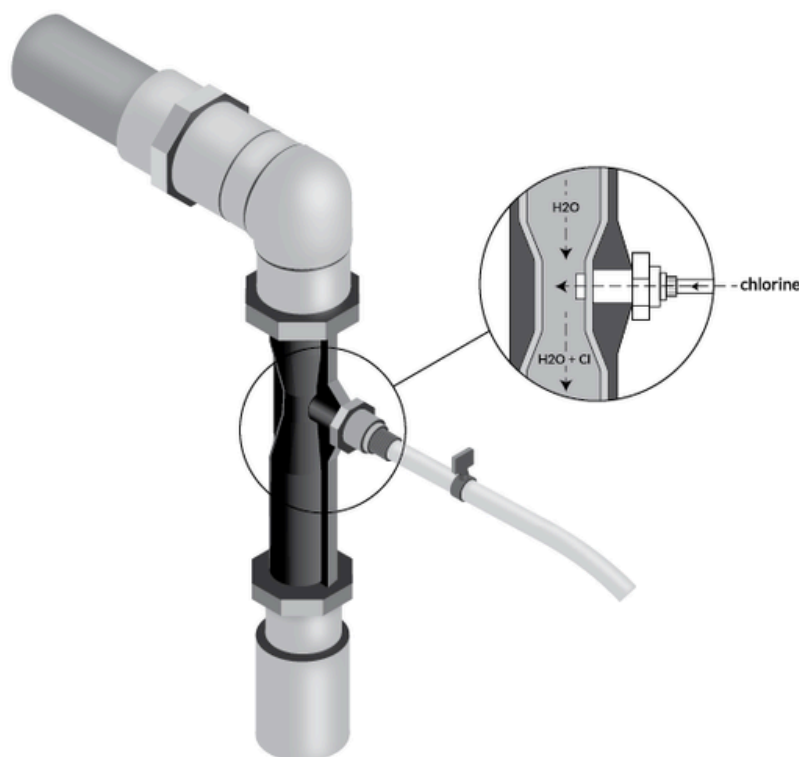
Parameter	Effectiveness
Bacteria	Very Effective (>99%)
Viruses	Very Effective (>99%)
Cryptosporidium (Protozoa)	Not effective (<80%)
Ascaris (Helminth)	Not effective (<80%)

Other parameters

Not effective for chemical contaminants or turbidity.

Source water requirements

Turbidity, organic matter, pH, and temperature affect how well chlorine works and how much chlorine is required. When possible, cloudy water should be pre-treated through sedimentation or filtration before using chlorine. Ideal turbidity should be below 5 NTU. Disinfection is less reliable if the pH is below 5.5 or above 7.5.



Capacity

The capacity of a Venturi chlorinator varies widely based on the device model. The size should be selected based on the expected range of flows of the piped water. The flow rate can be determined with a bucket and a stopwatch. Use a bucket with a known volume (V) in litres and divide that by the time (t) it takes to fill up in minutes. This will provide you with a flow rate (q) in L/min.

$$q=V/t$$

Venturi's have been used in water kiosks to provide disinfected drinking water to communities.

Life span

Varies per device and depends on device usage, but generally 5-10 years. Regularly check for cracks, damaged or worn out valves, clogging or insufficient flow rate. Refer to device instructions when available.

Calibration and Dosage Adjustment

Regularly test the free-residual chlorine at the outlet to ensure proper dosage. Adjusting the dosage can be challenging due to varying water quality. Experts recommend performing the Modified Horrocks' test using the corresponding volume of 1% chlorine solution in the Venturi system. Some devices feature a needle or internal valve for independent chlorine dosage adjustment. Refer to the manufacturer's instructions for device and installation guidance.

Ease of use and acceptability

Operation and maintenance

To use Venturi chlorination the community requires some established infrastructure, such as piping or a storage tank. This device can be installed directly before a water outlet, but still requires a contact time of at least 30 minutes before drinking. This can be accomplished in the users' covered containers after collection from an outlet, or by adding an in-line storage tank after the device. Venturi chlorinators require minimal operation and maintenance. Generally, Venturi in-line chlorinators only require the following:

- Free-residual chlorine testing at the outlet and household to ensure proper dosage and to meet odour/taste preferences.
- General maintenance to ensure the device is operating as intended. This can include checking the flow rate and inspecting the tubing and valves to ensure there are no leaks, clogging or damage. Replace equipment when deterioration is visible, generally after 5-10 years.
- Routine checks for chlorine replenishment.

Repair and replacement

Replenishment of liquid chlorine is required, and should be purchased/refilled before the device is low or empty. Note that this system uses a 1% liquid solution and dilution may be necessary. See *How to Make a 1% Chlorine Solution* for more information on this process.

User considerations and preferences

An ongoing supply chain is needed for liquid chlorine. Chlorine products degrade over time and must be stored in a dry, dark and secure location: See Store Chlorine Products Safely Poster and Handle Chlorine Products Safely Poster for more information. When using the device try to keep the chlorine solution away from sunlight. Some users do not like the taste or smell of chlorine.

Feasibility

Availability

Venturi pipes for chlorination are broadly available, but can depend on local markets.

Cost

The cost of a Venturi chlorinator varies widely based on the model and local market. The operational costs per m³ of treated water are US\$0.82 for the Venturi according to a study done by EAWAG in rural Uganda in 2018. The cost of liquid chlorine varies from US\$0.45–3.29 per 1,000 L.

Size and weight

Venturi pipe size and weight can vary greatly depending on their model and material, Smaller PVC options range from about 1-5kg, larger steel or aluminum models can weigh much more. It is important to consider size and flow rate of the pipe system in which the Venturi will be installed.

More information

1. [Store Chlorine Products Safely Poster](#)
2. [Handle Chlorine Products Safely Poster](#)
3. [Check Before You Disinfect: Turbidity, pH, and Temperature in Drinking Water Chlorination](#)
4. [Chlorine Disinfection of Household Drinking Water](#)
5. [How to Make a 1% Chlorine Solution](#)
6. [Crider, Yoshika S., et al. "Passive In-Line Chlorination for Drinking Water Disinfection: A Critical Review." *Environmental Science & Technology*, vol. 56, no. 13, 2022, pp. 9164–9181. <https://doi.org/10.1021/acs.est.1c08580> \[pubs.acs.org\]\(https://pubs.acs.org\)+4](#)

This resource is open content and licensed under a [Creative Commons Attribution -ShareAlike4.0 International License](#). Refer to CAWST's guidelines for distributing, translating, adapting or referencing CAWST resources ([resources.cawst.org](#)).



Calgary, Canada cawst.org | support@cawst.org