



EVOQUA NSF CERTIFIED GENERATORS – 2 CHEMICAL C-VF SERIES FLOW PACED MILLENNIUM III™ CHLORINE DIOXIDE GENERATOR

The Millennium III™ Series generators are the next generation in chlorine dioxide technology combining high safety performance with durability, simplicity of use and ease to maintain. The generators are designed, built and certified in compliance to NSF 61, Section 8 standards.

The Millennium III™ Series C-VF generators combine a 25% or 31% sodium chlorite solution with chlorine gas under vacuum conditions to generate chlorine dioxide safely and efficiently. They are available as a free-standing configuration with size appropriate FRP batch tank, level controls, PLC/HMI control panel, and multi-point flow-paced distribution capability with integrated titanium metering pump(s) and magnetic flow-meter combinations.

The Millennium III™ Series C-VF generators are available in a range of capacities from a few pounds per day to 12,000 pounds per day all utilizing a standard modular design.

Options available include:

- Flow paced multi-port ClO₂ distribution panel (1-3 ports)
- Optical dual channel ClO₂ controller/sensor (0-4000 PPM) for real time monitoring of the aqueous chlorine dioxide dosing solution strength
- SFC / MFC series controller with Depolox® 5 analyzer, Varisens™ flow cell, ClO₂ and chlorite ion residual probes, Micro/2000® real time ion specific chlorine dioxide residual (0.1-2.0 PPM) analyzer, ORP/pH monitors, and GMS Plus ClO₂ in-air monitor / leak detector.
- Chlorine dioxide vent gas air scrubber

Key Benefits:

- Direct flow path of motive water and chemical precursors provide for minimal pressure losses and improved flexibility.
- Injector design improves overall performance.
- Rotameters and check valves are designed specifically for their intended uses.
- Materials of construction are compatible with chlorine dioxide and chemical precursors.
- Control interface is through an interactive PLC / color HMI touch screen offering SCADA interface capability
- The safe generation of chlorine dioxide continues to be a primary design consideration. Generation under vacuum is used to minimize and control the reactions and concentrations. The design ensures safe shut down of the generator during component failure or loss of motive water that drives the injector.
- Efficiency and yield is maximized by reaction of chemical reactants in their concentrated form. These reaction conditions favor the immediate formation of chlorine dioxide, thereby minimizing byproduct formation found in other types of generators.

Equipment Description

Generator:

- The same basic process is used for all models, from simple manual units to the most complex automatic model.
- Simple design reduces operational difficulties. This two chemical process does not require pH control or excess chlorine addition. The result is lower operating costs, less maintenance, simplified operator control and precise calibration of the feed system. The pH of the chlorine dioxide exiting the generator is typically 6 to 7.
- **Reaction Column:** The reaction column disperses the chemical reactants allowing for intimate contact and immediate reaction. The reaction column is designed to maximize generator yield of chlorine dioxide.
- **Reagent Flowmeters:** A metering tube design calibrated for each chemical reactant is available along with optional magnetic flow meters and auto metering control valves. All generators are supplied with custom feed rate charts correlating pounds per day (or kg / hour) of chlorine dioxide with flow meter and PLC settings.
- **Injector Requirements:** Water passing through the injector generates the vacuum required to pull the two feed chemicals into the reaction column of the chlorine dioxide generator assembly while also serving as the dilution water that the vacuum ejected chlorine dioxide gas is dissolved into. A multi-stage centrifugal booster pump in conjunction with a pressure regulator valve ensures that the feed / motive water supply is at the correct rate and pressure. A safety flow switch protects the pump in the event of water loss. Water temperature requirements are < 100°F/ 37°C. If higher temperature water is used (>100°F/ 37°C), injector performance may be impaired due to decreased solubility of the dissolving chlorine dioxide gas. Motive water temperature should never exceed 115 degrees F.
- **Batch Tank:** The batch tank is constructed of FRP resin compatible with chlorine dioxide up to a concentration of 5,000 ppm. The batch tank is fitted with an ultrasonic level indicator that controls fluid levels in the tank preventing overflow conditions or low level conditions that can result in distribution pump failure. A redundant emergency mechanical kynar safety float switch, independent of the ultrasonic controller, protects the system from over-flow conditions in the event of a primary level control system failure.
- **Distribution Panel:** The generator is fitted with one single flow paced output as standard. Additional effluent flow paced outputs are available upon request.

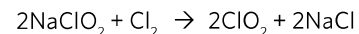
- **Power Requirements:** Each system is supplied with an electrical control box incorporating an ON/OFF control switch. Standard voltages are 110/220 VAC single phase or 480 VAC three phase. Other power supplies can be accommodated. Consult your Evoqua sales representative for more details.

Assembly:

- All components are securely mounted on specially designed stainless steel skid(s) with a small footprint allowing placement in space constricted areas. Split frames are also available as a custom option if door entry size should require such.
- The skid construction is heavy duty, allowing location in operating areas that are subject to severe service conditions.
- Each valve and flow meter is secured to the frame to minimize vibration and flow related stresses. Piping runs are designed to insure a simple and safe flow path.
- Components requiring maintenance are easily accessible.

Typical Specifications

Chlorine dioxide feed equipment shall be manufactured by Evoqua and shall be comprised of a chlorine dioxide generation process utilizing 25% sodium chlorite solution and chlorine gas based on the following stoichiometric reaction:



The reaction of sodium chlorite solution and chlorine gas shall take place under vacuum without the use of a separate mineral acid feed or the excess chlorine method (adding chlorine in excess of the stoichiometric chlorine requirements in order to lower the process pH). Excess chlorine shall be considered as any amount greater than 10% of the chlorine stoichiometric requirements that remains in the generator product as unreacted chlorine.

The feed system shall be arranged with equipment to suit plant requirements. The generator shall maintain a minimum yield efficiency of 95% chlorine dioxide under normal operating conditions. Yield shall be defined as the maximum production of chlorine dioxide, compared to the theoretical maximum available, where;

$$\% \text{ Yield} = (\text{ClO}_2 / (\text{ClO}_2 + \text{ClO}_2^- + (\text{ClO}_3^- * 67.45/83.45))) * 100$$

The theoretical maximum shall be determined from the feed rates of the chemical reactants. They shall be confirmed by an Amperometric analysis capable of differentiating between chlorine, chlorine dioxide, chlorite and chlorate ions. Analysis shall be confirmed by the procedure as described in Standard Methods for the Examination of Water and Wastewater, APHA-AWWAWEF, 20th edition 1998, Amperometric Method II, 4500-ClO₂E.



210 Sixth Avenue, Suite 3300, Pittsburgh, PA 15222

+1 (866) 926-8420 (toll-free) +1 (978) 614-7233 (toll) www.evoqua.com

Varisens and Millennium III are trademarks of Evoqua, its subsidiaries or affiliates in some countries.

All information presented herein is believed reliable and in accordance with accepted engineering practices. Evoqua makes no warranties as to the completeness of this information. Users are responsible for evaluating individual product suitability for specific applications. Evoqua assumes no liability whatsoever for any special, indirect or consequential damages arising from the sale, resale or misuse of its products.

© 2017 Evoqua Water Technologies LLC Subject to change without notice MS-MILLIIIICVF-DS-0717