

CO₂ Addition System

TETRApHix™

pH Adjustment for Drinking Water

De Nora offers the TETRApHix™ CO₂ Addition System, an ideal solution for use in drinking water applications requiring the control of pH. Individual systems can treat a capacity up to 1500 gpm (340 m³/hr) at various raw water pH levels, increased capacity accommodated by additional membrane elements. This advanced system offers increased gas

efficiency, low maintenance, and a smaller footprint compared to other commercially available and conventional carbon dioxide pH adjustment systems. The TETRApHix™ system is easily integrated into existing systems and controls, resulting in a simple and economical installation in new, existing, or retrofitted water treatment facilities.





Features and Benefits

- Efficient pH adjust system with minimal degassing
- No hazardous chemical handling required
- Reduced liability to system owners and operators
- Maintains stable water conditions
- The shortest mixing time available for any CO₂ pH adjustment system

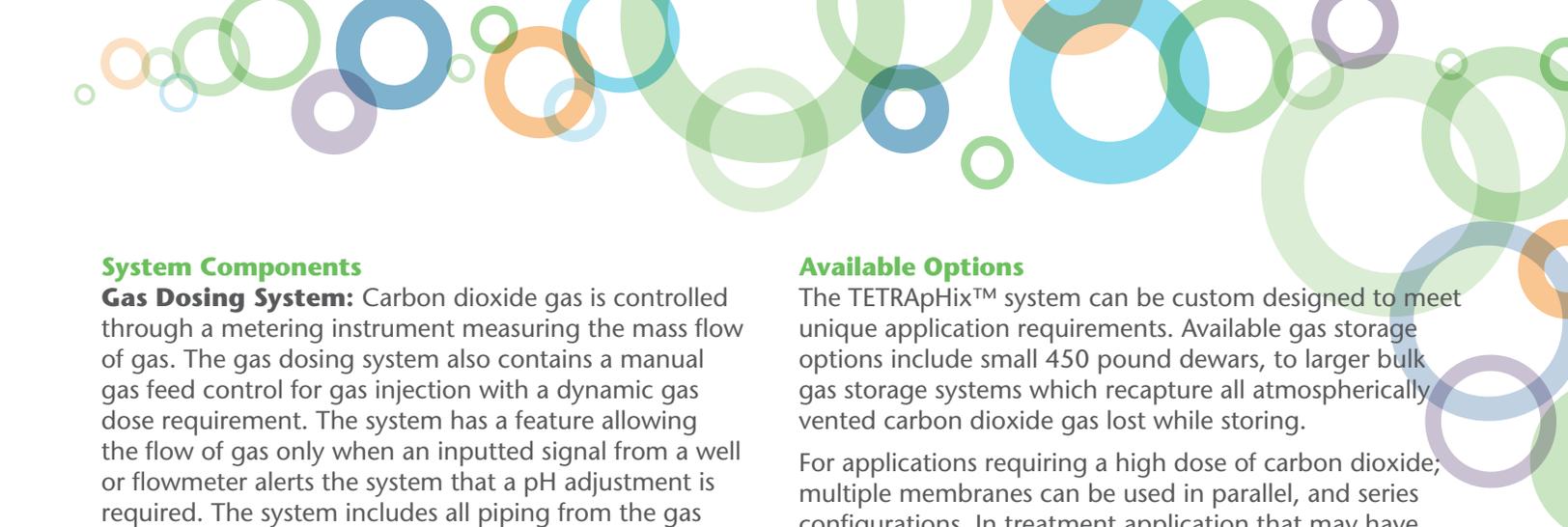
Process Description

The TETRApHix™ system offers a unique approach to mix carbon dioxide gas with process water by utilizing a hollow fiber membrane as the interface between the gas and water. Carbon dioxide gas is the safest and simplest means of adjusting pH.

The TETRApHix™ system contains three main components; a gas dosing system, a membrane unit, and a main control system.

A small side stream of water is diverted from the main water flow and passed through the membrane unit. Carbon dioxide gas is fed through the membrane using only the pressure of the gas storage cylinders. The micropores in the membrane fibers disperse the carbon dioxide gas to near molecular size, allowing for instantaneous mixing. The fluid flow travels parallel with the membrane fibers, allowing for extended contact time between the gas interfacing off the membrane strands and the water. The TETRApHix™ system boasts the highest gas/water interface surface area for carbon dioxide pH adjustment systems available.

A natural reaction occurs between the water and the carbon dioxide gas to form carbonic acid. The pH adjusted side stream is then reintroduced back into the main flow stream and pH is measured after mixing. The mixing time is much shorter than other available technologies due to the microbubbles' quick interaction with the water.



System Components

Gas Dosing System: Carbon dioxide gas is controlled through a metering instrument measuring the mass flow of gas. The gas dosing system also contains a manual gas feed control for gas injection with a dynamic gas dose requirement. The system has a feature allowing the flow of gas only when an inputted signal from a well or flowmeter alerts the system that a pH adjustment is required. The system includes all piping from the gas storage tanks to the membrane unit. Multiple storage systems with automatic and seamless switchover are also available to allow the TETRApHix™ to remain in operation while replenishment of an empty storage cylinder is completed. Sizes of the gas storage units are custom for each application.

Membrane System: The membrane system incorporates a specially designed housing where the membrane is inserted into and quality tested prior to use. The NSF approved membrane is composed of hundreds of microporous hollow fiber membrane with micropores of a specific diameter allowing only the carbon dioxide gas to diffuse through the fiber strands. As a result, the well system remains pressurized even when the water distribution system and pH adjustment system are not in use. The membrane system also includes a filter to protect the membrane while increasing the membrane life expectancy and maintaining efficiency.

Control System: A complete control system is provided to control pH. The main component of the control system is the PLC and HMI touch screen. The HMI allows operators to adjust the control system and manually dose carbon dioxide gas. The main process parameters are entered into the HMI and tuned for the specific application requirements. The PLC utilizes the entered parameters to decide the mass quantity of carbon dioxide gas to deliver to the water system and relays this to the mass flow valve in the gas dosing system. TETRApHix™ comes standard with adjustable high and low pH alarms as well as alerts of gas supply replenishment requirements with large storage or multiple dewar gas storage arrangements.

- The system operates on a basic proportional gas dose (mg/L). The dose is then “trimmed” using feedback from the pH probe located downstream of the main process piping after the side stream is mixed, or after the treatment process. By placing the pH analyzer downstream of the treatment process, the treated water offers a cleaner source of water, allowing the pH analyzer to require less maintenance.

Available Options

The TETRApHix™ system can be custom designed to meet unique application requirements. Available gas storage options include small 450 pound dewars, to larger bulk gas storage systems which recapture all atmospherically vented carbon dioxide gas lost while storing.

For applications requiring a high dose of carbon dioxide; multiple membranes can be used in parallel, and series configurations. In treatment application that may have high TSS or contaminants such as a softening application, a secondary water source may be used to feed the membrane system. The secondary source could be as simple as using the effluent of the treated water to recirculate and also make the pH adjustment system more efficient.

The gas dosing system and programming can easily be integrated into an existing control system that currently employs a SCADA system or other local controls.



WATER MADE EASY

MARINE

ENERGY

MUNICIPAL

INDUSTRIAL



DE NORA
our research - your future

info.dnwt@denora.com

www.denora.com

© Copyright 2017 Industrie De Nora S.p.A. - All rights reserved.

De Nora, ON circle, Our research - your future, electrochemistry at your service (and any other trademark name) are trademarks or registered trademarks of Industrie De Nora S.p.A. in Europe and/or other countries. Other trademarks used herein are the registered trademarks of their respective owners.

The information contained herein is offered for use by technically qualified personnel at their discretion and risk without warranty of any kind.

DNWT - TETRApHix™ CO₂ Addition System - 650.0080.3 - 1/2017