Pan America Environmental, Inc.

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ENGINEERING SPECIFICATION

EpH Series pH Neutralization System

Engineering Specification

MODEL RANGE	GET A QUOTE	SPEAK TO AN ENGINEER
EpH-5 through EpH-200	technical@panamenv.com	262.716.0105

PRODUCT PAGE

https://www.panamenv.com/chemical-treatment/eph/

SECTION 1.0 EQUIPMENT DESIGN & CONSTRUCTION

1.01 System Components

The EpH neutralization system shall consist of the following components: Reaction tank, fixed mixer(s), pH controller, Quick remove/replace pH sensor probe, electronic chemical metering pump(s). pH adjustment of industrial waste water will be effected by chemical injection and pH monitoring.

Applications

- industrial pH neutralization system
- continuous pH neutralization system
- batch pH neutralization system
- automated pH neutralization skid
- pH neutralization for industrial effluent
- acid neutralization system
- alkaline neutralization system
- pH correction system wastewater
- pH neutralization plant
- custom pH neutralization system
- pH neutralization for manufacturing wastewater
- pH control system for wastewater treatment

1.02 Flow Rate

The continuous system flow rate shall be per the model selected, EpH-5 through EpH-200 (see EpH Series Dimensions & Flow Rates).

1.03 System Design

The EpH Series system will be designed and fabricated per the following specifications. The design will incorporate materials of construction compatible with the wastestream characteristics and customer/environment application requirements.

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1.04 Reaction Tank

Influent flow enters the clog proof influent diffuser pipe directs the flow toward the bottom of the reaction tank. Standard tank construction shall be a rotomolded, UV resistant, HDPE, polyethylene open top tank with PVC or polypropylene inlet/outlet/drain. Fittings shall be FNPT.

1.05 Mixer

The reaction mixer shall be an industrial duty, 1750 RPM, universal mount direct or gear driven design with 316 stainless steel shaft and axial flow type impeller(s). Motor shall be TEFC, 100,000 hour bearing with dual set screw motor shaft to mixer shaft coupling, cast aluminum motor mount base.

1.06 pH Controller

The wasteflow pH will be continuously monitored and chemical metering pump controlled by a microprocessor based controller transmitter with tactile keyboard, large, bright, 5 character LED readout. Controller features shall include: switch selectable operation in pH units or mV, isolated 4-20 mA powered output, self configurable for manual temperature or ATC, dual relay outputs for alarms or pump control, adjustable or built-in deadband. pH range is to be 0-14 pH with a resolution of at least 0.01 pH. The controller shall be housed in the Master Control Panel. Controller shall be wired to the pH probe and to the chemical metering pump(s).

1.07 pH Probe

The pH probe shall be a flat surfaced, sealed reference design. The probe shall be detachable from the probe body and will include a body-to-probe seal. Body and probe construction shall be CPVC. The probe will be mounted to a quick remove/replace assembly to allow removal and replacement without tools. Probe to be wired to the controller via a BNC style cable. The probe shall be tank mounted via a quick release coupling assembly requiring no tools for removal.

1.08 Chemical Metering Pump(s)

The system chemical metering pumps are provided on the top of the EpH tank and consist of the following:

Chemicals being metered:

(1) Caustic	(NaOH)
(1) Acid	(HCL or H2SO4)
(1) Sodium Bicarbonate	(NaHO3)

Solenoid driven diaphragm metering pumps are provided and include the following features:

- NEMA 4/IP66 thermoplastic housing
- Wet end and diaphragm matched to chemical being metered
- 50-150 psi discharge pressure based on GPD/HR and model used
- Stroke and frequency adjustment knobs on pump face
- 4-20mA input for external pacing of frequency control providing speed control via Intell-i-Touch control logic
- Stroke rate and length turn down ratios of 10:1 each for a total of 100:1
- Viscosities up to 1,000 cP for coagulant/caustic/acid
- Low current and amp draw drive system
- Continuous duty rated design

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- Injection quill with integral back pressure valve provided at tank injector
- Bleed valve on discharge
- Suction tubing with foot valve, screen & ceramic weight
- Poly tubing plumbing and/or PVC or materials as required by volume and chemicals being metered
- Controls in MCP

1.09 System Cover

The system will be provided with a 304 SS cover to contain tank process vapors. An inspection hatch is provided to view tank interior. A 2" FNPT vent fitting is provided to allow venting vapor outside of tank via whichever plumbing type/configuration you require. All of the system components will be mounted, wired and plumbed to the tank cover.

1.10 Storage Tanks

The following storage tanks are provided:

(1) Caustic	15 gallons, 20”D X 28”H, double walled, HDPE, (1) 1” FNPT, (1) 2” FNPT, (1) 3/8” pump suction top fittings
(1) Acid	15 gallons, 20”D X 28”H, double walled, HDPE, (1) 1” FNPT, (1) 2” FNPT, (1) 3/8” pump suction top fittings
(1) Sodium Bicarbonate	30 gallons, 22”D X 42”H, double walled, HDPE, (1) 1” FNPT, (1) 2” FNPT, (1) 3/8” pump suction top fittings
Covers:	All tanks have an 8” thread on lid
MOC:	HDPE polyethylene
(3) Ultrasonic level sensor:	Provided in each tank to monitor chemical levels and alert at multiple levels as input by the operator at MCP

1.11 Effluent Monitoring System

The following system is provided:

Immediately following the EpH effluent an effluent monitoring and datalogging system is provided to monitor flow and pH. The tank will maintain a level to allow pH sensor to remain wetted. Flow will gravity discharge from EpH discharge and pass through this tank to allow continuous pH monitoring and flowmeter measurement and will provide the following:

- (1) Effluent monitoring tank, 50 gallons, polyethylene 24”D X 43”H, domed top, 8” access hatch, 2” FNPT inlet/outlet
- (1) pH sensor with quick remove assembly for maintenance/cleaning, 4-20mA output to MCP
- (1) Flowmeter plumbed on discharge outlet, magmeter, local display, 316 SS construction, 4-20mA output to the MCP
- (1) Secondary containment
- Intell-i-Watch monitoring functions are integrated into our Intell-i-Touch controls package in the MCP. The flow & pH will be datalogged.

Secondary containment:	47” X 47” X 17”H, 100-gallon volume, polyethylene construction

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1.12 Master Control Panel (MCP)

System MCP design will be per the following:

PLC/UIT Based Design

The options provided with this quotation will include controls that will be integrated into one, centralized Master Control Panel (MCP). The MCP will provide the following controls:

- Mixer on/off
- 3 Chemical pump on/off. Bicarbonate pump logic to provide
- UIT User Interface Touchscreen
- pH monitoring and neutralization control
- Effluent pH & flow monitoring/totalization
- Local power disconnect is optional
- Pump controls

MCP power required:	115V/1pH/60Hz
Control power:	110V/1pH/60 Hz. & 24VDC
Enclosure:	NEMA 4X, FRP construction, ANSI 61 grey enamel gel coat.
Designed per:	UL508, NEC
Conduit:	EMT/Liquid tight
Wire:	THHN
Logic:	PLC
Controls platform:	Intell-i-Touch
Monitoring platform:	Intell-i-Watch (integrated into the Touch system)

PLC Based Design

The MCP will be provided as a PLC based logic design. The system is as follows:

- Unitronics Unistream PLC system or other as available.
- 5" UIT color touchscreen
- Unilogic software for PLC programming.
- SD card
- Datalogging of pHs, flow and other conditions
- Ethernet ready

Communications Capabilities

- TCP/IP via Ethernet
- MODBUS and other protocol support

Alarms

The following alarms are provided:

- pH, low & high
- Chemical levels low & low-low

1.13 Corrosion Products

The system is designed with the following Materials Of Construction (MOC):

- Polyethylene/PVC tank and fittings
- 304 SS cover
- 316 SS mixer shaft/impeller.

If your wastestream is a highly corrosive solution, process fluid stream, strong wastewater or waste acid or caustic solution please provide us with the details of the fluid so we can match MOC to the waste stream. If skid mounted, building, trailer or container mounted the MOC of these items will also have to be checked against the waste stream.

1.14 Vaporous Materials

If your waste is vaporous please provide any details you have about conditions that create the vapor. As vapors can carry corrosive materials beyond the immediate vicinity of the reaction tank and/or can be heavy and form at floor level or be light and move throughout the entire air column in the vicinity we may need to know this in order to design your system properly.

1.15 Exothermic Reactions & Temperatures

If your wastewater is a solution with a chemical strength that may produce an exothermic reaction when caustic or acid are metered into it Pan America needs to be made aware of this as the plastic reaction tank may or may not be compatible with the temperature the reaction could create. Contact us if this may be a possibility as we may need to use a different tank construction material to withstand expected temperatures or potential aggressive chemistry. Continuous operation at elevated temperatures and certain chemicals and concentrations can shorten the tanks life expectancy.

1.16 Duplex Neutralization

The EpH systems can be plumbed together in series pairing them for duplex neutralization where multiple stage control and/or pH manipulation is desired or required for high confidence pH control. Simply install two identical systems in series and each will provide independent monitoring and pH control. Standard pump provision is a single pump to change pH in one direction per tank.



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SECTION 2.0 SUBMITTAL PACKAGE

2.01 Submittal Approval Package

Upon receiving an order Pan America Environmental will engineer and produce a Submittal Approval Package, which allows you the customer to review and change or keep aspects of the system detailed in this quote. The submittal package provides the following at a minimum:

- General arrangement drawings, 2D, 3D, plan, end, sectional, detail and other views
- Hydraulic profile
- Electrical schematics
- Control panel physical layout
- Process/control narrative (where project size is applicable)
- Component datasheets
- Component cutsheets

Options

- P&ID
- Structural, seismic, wind load, lifting lug review, anchorage and/or other PE review calculations
- Design sizing PE calculations and/or calculations of any other types
- Testing review and implementation during fabrication and assembly, i.e. NDT, NDE, radiographic, x-ray, ultrasonic, magnetic particle exam, others
- Piping testing per desired standards, i.e. ASME B31.1 power piping, ASME B31.3 process piping
- Rigging and lifting guide, drawings and/or procedures and methods
- WPS, ITP, PQR, PMI, others
- Document, QC report and/or other project document binder
- Mill certificates

Revisions & Meetings

The submittal package contains a limited amount of engineering and provides a maximum of Two (2) revisions of up to 10% maximum each. This quote does not include open ended, extensive or continuous revisions until approval is given. This submittal package does not include: Iterative R&D and review projects, design/redesign projects, pre-submittal before or after order placement to attain approval from the end user before order is placed, honored or executed by Buyer, engineers/consultants, contractors and/or other parties involved with this project. In addition, numerous and/or excessive meetings relative to the system design and complexity are not provided as PAE strives to have all valuable communications in writing so as to create a trackable/traceable project evolution.

Engineering Only

The quotation provides a limited amount of engineering and does not provide “Engineering Only”. The limited engineering is part of the system cost and is provided to give direction and final understanding as to what is being provided to you in the system design. The quoted and submitted system is a proprietary PAE product and PAE will not produce drawings for you to build, license, bid out or produce and/or market as your product for your or any other entities use.

EpH pH adjustment systems can be used in combination with many other Pan America Environmental water treatment system types such as:

Dissolved Air Flotation

https://www.panamenv.com/dissolved-air-flotation-daf/pdaf-plate-dissolved-air-flotation/

Slant Plate Clarifiers

https://www.panamenv.com/clarifiers/spc-slant-plate-clarifier/

Oil Water Separators

https://www.panamenv.com/oil-water-separators/stainless-steel-oil-water-separator-ose/

https://www.panamenv.com/oil-water-separators/os/

Filter systems

https://www.panamenv.com/bag-filter/

https://www.panamenv.com/zeomaxx/

EpH Series Dimensions & Flow Rates



EpH Systems Detail					
Model	Flow GPM	Dimensions D X H	Volume Gal.	Inlet/outlet size	Wt Lbs
EpH.05	5	22” X 48”	50	1.5”	95
EpH.10	10	30” X 48”	100	1.5”	120
EpH.15	15	31” X 62”	150	2”	135
EpH.25	25	39” X 65”	250	2”	140
EpH.30	30	45” X 60”	300	3”	152
EpH.40	40	52” X 60”	400	3”	170
EpH.50	50	60” X 58”	500	3”	200
EpH.70	70	61” X 72”	750	4”	375

*Not for construction, dimensions/designs subject to change, flow rates are nominal

Plastics Discussion

Polyethylene

A high-quality thermoplastic that has outstanding resistance to both physical and chemical attack is well suited to pH adjustment and neutralization systems. The overall general toughness and excellent chemical resistance to a wide array of wet and dry industrial chemicals and food products make polyethylene ideally suited for storage tanks and containers. Polyethylene is translucent and its natural color ranges from slightly off white to creamy yellow, depending on wall thickness and type. Ultraviolet light stabilizers are added for use in outdoor applications.

A) Linear Polyethylene Linear Polyethylene is available as low, medium and high density. Most products offered in this product line are molded of linear medium density polyethylene (LMDPE) and linear high-density polyethylene (LHDPE). They have superior mechanical properties, high stiffness, excellent low temperature impact strength and excellent environmental stress crack resistance. The linear polyethylene used meets specifications contained in FDA regulation 21CFR177.1520 (c) 3.1 and 3.2 and so may be used as an article or a component of articles intended for use in contact with food, subject to any limitations in the regulations. Maximum operating temperature for linear polyethylene is 140° F. BPA-Free Material.

B) Crosslinkable Polyethylene Crosslinkable polyethylene is a high-density polyethylene that contains a crosslinking agent which reacts with the polyethylene during molding, forming a crosslinked molecule similar to a thermoset plastic. This reaction improves toughness and environmental stress crack resistance. Crosslinked Polyethylene (XLPE) is not weldable and does not meet FDA requirement 21CFR177.1520. Maximum operating temperature of crosslinked polyethylene is 150° F.

Polypropylene

Polypropylene is a rigid plastic that has a higher operating temperature limit than polyethylene: 212° F. It offers good chemical resistance and has a high resistance to stress crack.

Polypropylene (PP) is not recommended for applications in sub-freezing temperature or where high impact strength is needed. A rough, irregular interior surface is common characteristic of molded polypropylene.

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Plastics in General

Considerations to material selection elevated temperatures:

Continued or prolonged service with contents at elevated temperatures can shorten the life of a tank. The effects of the temperature will depend on the chemical content and its specific gravity, tank size and configuration, material of construction, wall thickness and if there are any external supports on the tank.

Exposure to Ultraviolet Light Unprotected: Thermoplastics exposed to sunlight for an extended period of time, absorb ultraviolet (UV) light, which can cause discolorations, embrittlement and eventual cracking. Fluorescent lighting has a similar effect. Elevated temperatures can accelerate the embrittling process. These products are molded from materials utilizing the latest technology for UV stabilizers which greatly reduce the harmful effects of UV light. For greater protection, keep tanks out of direct sunlight or order dark colored tanks which will further retard the effect of UV light.

Environmental Stress Cracking Certain surface-active materials, although they have no chemical effect on polyethylene, can accelerate its cracking when under stress, such as liquid detergents and ultra-pure water. Elevated temperatures tend to accelerate the cracking. Although all polyethylenes are subject to stress cracking, some are more resistant to it than others. The degree of stress on the plastic has a direct bearing on its resistance, therefore a tank and system should be designed to minimize stress. Poly tanks are molded visually stress free, employing materials that are highly resistant to environmental stress cracking, and hence are less prone to cracking than fabricated tanks. Stress cracking agents are surface active materials. Proper care should be taken to reduce stress at fillings, bands, tie down lugs, etc.

Product Uses

- pH neutralization controller
- pH neutralization pump skid
- inline pH neutralization system
- two-stage pH neutralization system
- three-stage pH neutralization system
- caustic soda pH neutralization
- sulfuric acid pH neutralization
- pH probe and controller system
- PLC controlled pH neutralization
- pH neutralization with CO2
- pH neutralization with lime
- pH neutralization with sodium hydroxide

Specifying an EpH Series pH Neutralization System for your project?

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