

CRESTLINE SANITATION DISTRICT

MEMORANDUM

DATE: 04/08/2021

TO: BOARD OF DIRECTORS
Crestline Sanitation District

FROM: Rick Dever
General Manager

SUBJECT: HYPOCHLORITE GENERATION SYSTEM

A. RECOMMENDATION

To approve the purchase of a 200 pound per day Sodium Hypochlorite system for redundancy for the Huston Creek WWTP which would benefit the entire District as well as the State Parks Facility located at 20951 Cleghorn Canyon Rd.

B REASON FOR RECOMMENDATION

The Huston Creek Sodium Hypochlorite system is currently used to generate a chlorine solution for Huston as well as keep Seeley and Cleghorn up and running during those times that these systems are down. Without this redundant unit it would make it difficult to meet discharge requirements.

C. OTHER INFORMATION

This piece of equipment is instrumental in ensuring that the District meets its' coliform requirements set by the State Water Resources Control Board. The purchase of this unit will allow for the original unit to go through a much needed rehabilitation. After its' rehabilitation the old unit will be used as a redundant system for the new unit.

D. FISCAL INFORMATION

The District budgeted \$130,000 for the replacement unit and the purchase price has come in under budget at \$115,000.

E. ATTACHMENTS

Proposal from PSI Water Technologies

BUDGET PROPOSAL

MICROCLOR® ON-SITE HYPOCHLORITE GENERATION SYSTEM FOR CRESTLINE SANITATION DISTRICT, CA



Reference picture of a Microclor® MC-40 On-Site Hypochlorite Generation System

PSI Water Technologies, Inc. File No.: P20-4684 Rev 1
CA Contractor's License: #877235

Prepared on: March 26, 2021

SALES REPRESENTATIVE

UGSI Solutions, Inc.
Kevin Sanner
550 Sycamore Drive
Milpitas, CA
Tel: (310) 975-9719
Email: ksanner@ugsicorp.com

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IMPORTANT NOTICE: All the information in this Proposal is confidential and has been prepared for Buyer's use solely in considering the purchase of the Equipment described. Transmission of all or any part of this Proposal to others or use by Buyer for other purposes is unauthorized without Seller's advance written consent.



March 26, 2021

Rob Lasher
Crestline Sanitation District

Re: On-Site Hypochlorite Generation System for Crestline Sanitation District, CA
PSI Water Technologies, Inc. File No.: P20-4684 Rev 1

Dear Rob,

Thank you for your interest in PSI Water Technologies, Inc. (PSI), a UGSI Solutions Company. We have prepared this budgetary proposal for providing one (1) replacement Microclor® MC-200 On-Site Hypochlorite Generation System for the existing MC-200 system at Crestline Sanitation District, CA. Our proposal is based on the following design criteria:

Design Criteria

System Rating, ppd 200

Our on-site hypochlorite generation (OSHG) system is a skid-mounted system. It consists of electrolytic cells, a rectifier, brine pump, piping, valves, instrumentation, and controls. Each system is pre-assembled, piped, wired, and factory-tested to facilitate simple installation and start-up at the jobsite. Ancillary equipment necessary to make a complete and functional system includes a hydrogen dilution blower, water softener, water and brine filters, brine tank, hypochlorite storage tank, and metering pump.

A detailed scope of supply and budgetary price for the complete system is listed in Section 1 of this proposal. All pricing is based on equipment, as outlined in section 1 of this proposal.

Our proposal is for budgetary evaluation purposes only. This budgetary pricing is intended to be a guide based on current costs. A request for updated pricing should be made every six months throughout the project evaluation and design stage in order to keep the project cost estimate accurate and current.

System Features & Advantages

The PSI Water Technologies, Inc. Microclor® On-Site Hypochlorite Generation System incorporates many features and advantages, including:

- Passive hydrogen removal increases operator safety
- Salt efficiency maximized by variable speed brine pump controlled by current feedback loop
- Constant current reliably achieved using an automated variable speed brine pump
- Advanced electrolytic cell design precludes the need for wet DC cable connections or internal baffles and gasketing
- Skid-mounted unique cell design and union connections allows for simple cell maintenance and replacement
- Reliable performance and robust construction reduces operator attention and lowers maintenance costs
- Pre-assembled, piped, wired, and tested at the factory prior to shipment



- Delivered and installed quickly, with minimal construction and installation cost
- Proven track record supported by years of successful operational experience

Our scope of supply follows in section 1 and our technical information in section 2. Section 3 includes our qualifications and experience, and sections 4 and 5 include case studies and our brochures.

We look forward to working with you on this project. If we can be of any further assistance, please do not hesitate to contact me at (310) 975-9719.

Thank you.

Sincerely,

Kevin Sanner
Regional Sales Manager

Cc: Andrew Lau, PSI Water Technologies, Inc.
David Shekhtman, PSI Water Technologies, Inc.



SECTION 1

SCOPE OF SUPPLY

Microclor[®] On-Site Hypochlorite Generation System

- A. Scope of Work by PSI Water Technologies, Inc.
- B. Scope of Work by Others

A. SCOPE OF WORK BY PSI WATER TECHNOLOGIES, INC.

The following equipment and services are included in our scope of work. All equipment will be manufactured in accordance with the descriptions below. Please see attached equipment general arrangement drawing for illustration and reference.

<u>No</u>	<u>Item Description</u>	<u>Qty.</u>
1.	Microclor® MC-200 On-Site Hypochlorite Generation System, Skid-Mounted, Pre-Assembled, Piped, Wired, and Factory-Tested, including: <ul style="list-style-type: none"> ▪ 40 ppd Electrolytic Cell (Qty. 5) ▪ Stainless Steel Brine Gear Pump with Integral Speed Control ▪ Water and Brine Rotameters ▪ Magnetic Flow Meter ▪ Optical Level Switch (Qty. 5) ▪ Temperature Switch (Qty. 4) ▪ Temperature Sensor ▪ Water and Brine Makeup Solenoid Valves ▪ 304 Stainless Steel, Electropolished Open Frame Equipment Skid 	1
2.	Skid-Mounted Transformer Rectifier, including: <ul style="list-style-type: none"> ▪ NEMA 3R Enclosure – 304 Stainless Steel Construction ▪ 24 kVA Step-Down Transformer – 300 VDC @ 80 ADC ▪ DC Bridge Rectifier with Diode Assemblies and Aluminum Heat Sink with Cooling Fan ▪ DC Current Transducer ▪ Panel-Mounted Disconnect Switch 	1
3.	Skid-Mounted Electrical Control Panel, including: <ul style="list-style-type: none"> ▪ NEMA 4X Enclosure – 304 Stainless Steel Construction ▪ Allen-Bradley MicroLogix 1400 Programmable Logic Controller with Ethernet Communication ▪ 6" Color Touchscreen HMI ▪ 24 VDC Power Supply ▪ Emergency Stop Pushbutton ▪ Panel-Mounted Disconnect Switch ▪ Current Sensor 	1
4.	Hydrogen Dilution Blower, including: <ul style="list-style-type: none"> ▪ Volumetric Flow Rate: 406 cfm ▪ Static Pressure: 3.36" ▪ TEFC Motor ▪ Air Flow Sensor Assembly 	1

<u>No</u>	<u>Item Description</u>	<u>Qty.</u>
5.	Heat Exchanger , including: <ul style="list-style-type: none"> ▪ 4" Shell ▪ Titanium Construction ▪ Teflon and Kynar Interconnection 	1
6.	Manufacturer's Field Services (3 Days at the Jobsite) , including: <ul style="list-style-type: none"> ▪ Installation Inspection ▪ System Start-Up ▪ Operator Training 	Included
7.	Submittal and Operation & Maintenance Manual as Follows: <ul style="list-style-type: none"> ▪ Submittal: Sent Electronically ▪ O&M Manual: Sent Electronically 	Included
8.	FOB Factory, Milpitas, CA with Full Freight Allowed to Jobsite, Crestline, CA	Included
BUDGETARY PRICE [ITEMS 1-8]		[US]\$115,000

B. SCOPE OF WORK BY OTHERS

1. **Brine storage tank and level controls (existing).**
2. **Hypochlorite storage tank and level controls (existing).**
3. **Hypochlorite dosing assembly and controls (existing).**
4. **Cartridge filters (existing).**
5. **Water softeners (existing).**
6. **Hydrogen detector (existing).**
7. **Acid cleaning (existing).**
8. Equipment unloading and installation.
9. All civil works and concrete pad for equipment.
10. Any underground or structural work.
11. Anchor bolts and seismic restraints.
12. All interconnecting piping, including between brine tank, OSHG skid, hypochlorite tank, metering pumps and accessories, and point of hypochlorite injection.
13. Water supply piping to water connection- **1" at 50-80 psi.**
14. Valves, fittings, appurtenances not specifically listed under Scope of Supply by PSI Water Technologies, Inc.
15. Heat tracing and insulation of all interconnecting piping, if required.
16. Electrical power to control panel (120/208-240V/1Ph/60Hz for 30A) and transformer rectifier (480V/3Ph/60Hz for 50A).
17. All power and control/signal, electrical conduit, wiring, electrical material, etc., including terminations, between control panel, brine tank, OSHG skid, hypochlorite tank, metering pumps, SCADA, etc.
18. Room ventilation, air conditioning, or lighting.



19. Any video recording.
20. All taxes, fees, lien waivers, bonds and licenses.
21. Any permitting or regulatory approvals.
22. Any items not explicitly listed under Scope of Supply by PSI Water Technologies, Inc.

SECTION 2

TECHNICAL INFORMATION **Microclor[®] On-Site Hypochlorite Generation System**

- A. Process Description
- B. Major System Components
- C. Control Philosophy
- D. System Features & Advantages
- E. Utility and Connection Requirements

Attachments

- FIGURE 1: Data Sheet
- FIGURE 2: Typical General Arrangement Drawing
- FIGURE 3: Typical Process & Instrumentation Diagram

A. PROCESS DESCRIPTION

A packaged on-site generation system will be provided that will manufacture a 0.8% \pm 0.05% solution of sodium hypochlorite (NaOCl) to be used as a disinfectant using salt, water and DC current. Equipment required for on-site hypochlorite generation includes consist the following major components (Fig. 1):

- One (1) Microclor[®] OSHG system including a programmable logic controller (PLC), rectifier, cells, brine pump, and hydraulic control equipment
- Water softener
- Brinemaker with makeup water solenoid valve, brine liquid level pressure transducer or switch, and remote display for both sensors
- Hypochlorite storage vessel(s) with ultrasonic level controls
- Chemical metering pump(s)
- Cast aluminum blower(s) with current and air flow switches

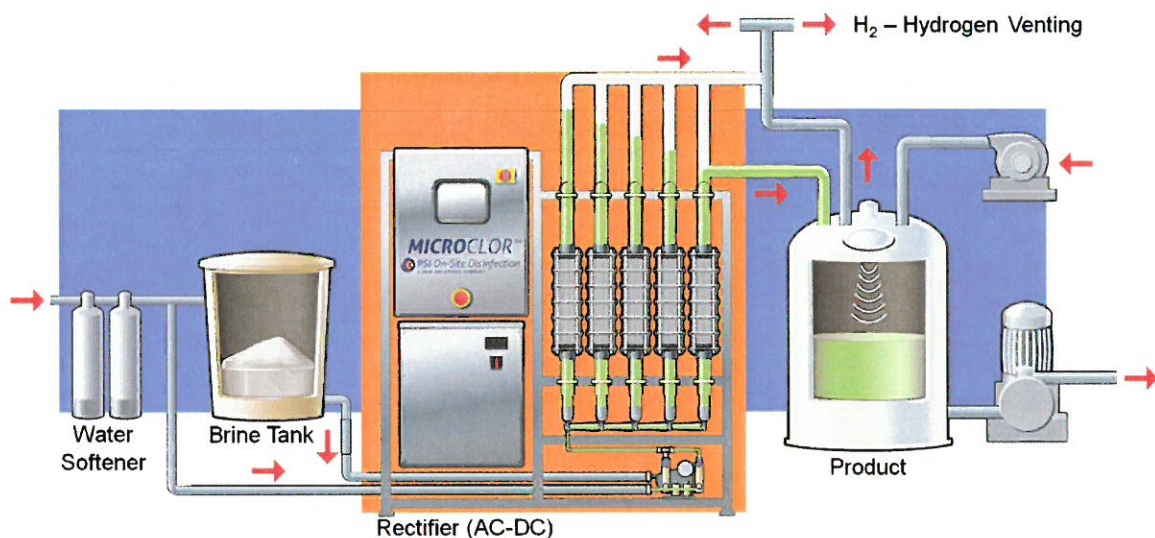


Figure 1. Diagram of the Microclor[®] process showing the placement of the ancillary equipment relative to the Microclor[®] system process skid.

The patented Microclor[®] system works by feeding softened water into the brine tank to form a saturated salt solution. This brine solution is pumped via a gear pump to a stream of softened water and diluted to approximately 3% salt concentration (a 10:1 ratio of softened water to concentrated brine). This 3% brine solution is fed into the electrolytic cells. DC current from the rectifier is applied to the electrolytic cell, and the brine solution is converted to a 0.8% concentration of sodium hypochlorite. During this conversion, a small amount of hydrogen is produced by the electrolytic process. This hydrogen is released safely through a vent pipe at the top of the electrolytic cell. The small amounts of hydrogen gas are further diluted at a minimum ratio of 100:1 using a dilution air blower which reduces the hydrogen concentration to less than 25% of the Lower Explosive Limit (LEL) of hydrogen gas.



The Microclor[®] system under normal operation is designed to automatically start and stop sodium hypochlorite production based upon the storage tank level. The PLC will function to monitor the hypochlorite level sensor. When the level reaches a preset low level point, a signal is sent to the OSHG controller to turn the generator on. Generation will continue while the OSHG controller continually monitors the storage tank level sensor. When the tank is full, and the high level point is reached, the Microclor[®] system will cease generation. The system will then remain in standby mode, continuously monitoring the tank level until a low level is reached.

A variable speed pump alters cell feed rate of the brine, or electrolyte, solution, based on signals from the PLC and a current transducer. This operational strategy allows the Microclor[®] system to vary the electrolyte solution conductivity so as to indirectly provide constant current. This philosophy eliminates expensive electronics that would otherwise be necessary to operate in a less reliable fashion.

Instrumentation is included to continuously monitor operational permissives during generator operation (airflow, current draw, water flow, flooded cells, and temperature). If any permissive times out, generator operation is interrupted. If the fault clears, generator operation is again called to run. If the fault reoccurs three additional times, the generation system is shut down and an alarm condition is sent to plant SCADA.

B. MAJOR SYSTEM COMPONENTS

The Microclor® On-Site Hypochlorite Generation System is pre-assembled, piped, wired, and factory-tested prior to shipping to the job site. Following are the major system components. **Additional details are provided in our equipment specifications.**

1. Electrolytic Cells

The transparent acrylic design of the electrolytic cells provides quick visual indication of operation and condition. Each cell shall include Viton flexible couplings for quick disconnect an optical level switch, and a temperature switch or sensor. A cell spool is provided for installation should a cell need to be removed for maintenance or replacement. On systems using five electrolytic cells in series, 80% of the total generation capacity can be achieved when one cell is removed.

2. Rectifier

The transformer rectifier uses an innovative design that eliminates the need for the outdated and unreliable switching rectifier or phase angle fired SCR voltage correction technology. The rectifier will be skid-mounted and the cooling fan pre-wired prior to shipment.

3. Brine Pump

The brine pump supplies a saturated salt solution to a stream of softened water for further dilution. Reliable brine feed is required for precise control of solution concentration. The pump flow rate is controlled automatically via an analog output.

Parameter	Value
Type	Gear
Material (Housing/Gears/Seals)	316SS/PPS/PTFE
Drive Type	Electromagnetic
Power Requirements	24 VDC
Speed Control	0-5 VDC

4. Hydrogen Dilution Blower

A critical component of the enhanced safety system, the blower is provided to dilute the hydrogen gas byproduct. The blower is shipped loose for installation adjacent to the hypochlorite storage tank and arranged such that the tank will be under positive pressure. All air from the blower and any fumes from the hypochlorite will be vented outside the building.

Parameter	Value
Fan Type	Pressure Blower
Wheel Type	Radial
Material	Cast Aluminum
Drive Type	Direct
Motor Type	TEFC

5. Water Softener

A dual-tank automatically-regenerating water softener treats the water supply prior to entering either the brine tank or the electrolytic cells. An adjustable water meter will monitor the processed volume and initiate system regeneration. A flow-based hydraulic control valve operates all functions of the softener, eliminating the need for any electrical connections.

Parameter	Value
Material (Media Vessel)	Fiberglass-Wrapped Polyethylene
Media	Non-solvent Cationic Resin
Regeneration Type	Countercurrent
Outlet Hardness as CaCO ₃ (Max.), gpg	0.5

6. Brine Tank

A tank is used for salt storage and brine production. Both manually- and pneumatically-filled tanks are available. Brine tank water makeup is controlled by a level sensor or switch. Pneumatically-filled tanks use a stainless steel salt fill tube, dust collection assembly, and salt level indicator. Depending on the tank dimensions, top and/or side access manways and a ladder with safety cage may be necessary to facilitate inspection.

7. Hypochlorite Tank

Hypochlorite storage tanks are sized for a specific amount of hypochlorite based on the peak generator capacity and project requirements. An ultrasonic level transmitter or pressure transducer continuously monitors the liquid level, initiating and ending operation of the generator. Hypochlorite fill, supply, drain, overflow, dilution air, and vent piping connections are typically included in the tank design. Depending on the tank dimensions, top and/or side access manways and a ladder with safety cage may be necessary to facilitate inspection.

8. Hypochlorite Metering Pump

A metering pump supplies disinfectant to the process from the hypochlorite storage tank. Reliable hypochlorite feed is required for precise control of chlorine residual. The pump flow rate is controlled automatically via 4-20 mA input signal sent to a variable frequency drive. Typical pump accessories are a calibration column, back

pressure valve, pressure relief valve, pulsation dampener, wye strainer, and pressure gauge.

9. Electrical Control Panel

The Microclor® On-Site Hypochlorite Generation Feed System includes a complete, pre-wired, PLC system. If the controls are remote mounted, a local junction box is provided on the generator system equipment skid.

The control system is designed to function using the power supply available at the installation site.

The PLC system, as a minimum, shall have the following interfaces and features:

- Programmable logic controller with color touchscreen HMI
- Ethernet communication
- “Water Solenoid Status” display
- “Brine Solenoid Status” display
- “Blower Status” display
- “Rectifier Status” display
- “Cell Level Alarm Status” display
- “Blower Air Flow Alarm Status” display
- “Blower Current Switch Status” display
- “Cell Temperature Alarm Status” display
- “Hypochlorite Tank Level” display
- “Cell Amperage” display
- “Cell Temperature” display
- “Cell Flowrate” display
- “Brine Pump Manual-Auto” selection
- “Brine Pump Speed” display and manual adjustment
- “Emergency Stop” pushbutton

10. Instrumentation and Miscellaneous Accessories

The on-site hypochlorite generation system shall include the following instrumentation and accessories:

- Water and brine rotameters
- Water and brine makeup solenoid valves
- Water flow sensor
- Cell Temperature Sensor and Switches
- Blower current sensor
- Blower air flow switch (shipped loose)
- Stainless steel open frame equipment skid

Depending on project constraints or customer requests, the following optional instrumentation and accessories, all of which will ship loose, may be available or required:

- Heat exchanger



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A UGSI SOLUTIONS COMPANY

- Water chiller
- Hypochlorite dilution panel with a magnetically-driven pump, rotameters, flow control valves, and venturi eductor
- Acid cleaning system
- Hydrogen detector
- Water hardness monitor
- Chlorine analyzer

C. CONTROL PHILOSOPHY

GENERAL

The onsite hypochlorite system consists of a local control panel that monitors the cell racks' onboard local I/O, hypochlorite tank level, hydrogen dilution blower, and all the functions associated with the hardness monitor (if equipped), salt and brine levels in the brine tank, and the brine fill solenoid valve . The panel ensures all safety interlocks are satisfied prior to initiating generator operation. Ethernet hardware is also provided to communicate over the plant's network.

LOOP DESCRIPTIONS

Discrete Inputs

- Cell level switches
- Cell temp switch(es)
- Rectifier high temp switch
- Brine pump fault
- Hydrogen dilution blower air flow switch
- Hydrogen dilution blower current switch
- High water hardness (if equipped)
- Emergency stop pressed

Discrete Outputs

- Run signal to the hydrogen dilution blower
- Open brine makeup water solenoid
- 3-way pilot valve
- Water solenoid valve
- Rectifier primary contactor
- Rectifier soft start contactor
- Rectifier bypass contactor
- Rectifier cooling fans
- Metering pump VFD run

Analog Inputs

- Brine tank salt level
- Brine tank brine level
- Cell DC amperage
- Cell flow
- Cell temperature
- Hypochlorite tank level
- Hydrogen monitor (if equipped)

Analog Outputs

Brine pump speed

LOOP COMMENTS

Discrete inputs are self-explanatory and consist of 24 VDC inputs switched between field device normally closed contacts while in operation. Any open circuit indicates a fault and the PLC logic shuts down operation and attempts to restart the system up to four times at which point the process shuts down and signals a shutdown alarm.

Discrete outputs are also self-explanatory and consist of 24 VDC PLC outputs that energize control relays. The control relays are configured as dry contacts or are wetted with AC or DC voltage as appropriate per the project requirements.

All analog inputs are 4-20 mA devices. Salt level, rectifier current sensor, and hydrogen monitor (if equipped) are sourcing while the balance of the inputs are loop-powered from the control panel.

All analog outputs are sourcing 4-20 mA outputs.

SYSTEM OPERATION

The generator system operates as a batch process where generation is initiated upon a drop in sodium hypochlorite tank level that reaches the start level, and remains in operation until the stop level is reached.

System operational capacity is not variable and is only responsive to changes in tank level. System operation commences at nameplate rating and continues operating until the stop point level is reached.

SYSTEM SET POINTS

Operator intervention is via the control panel.

The primary display provides momentary virtual switches for start, stop, and reset plus a soft switch for enable/disable, which cannot be overridden remotely or by SCADA commands.

The set point display is password protected and allows for operation input of the following signals:

- Start point 0-100%
- Stop point 0-100%
- Amperage set point
- High amperage alarm
- Low amperage alarm
- Low flow alarm
- High flow alarm
- Tank high-high level
- Tank low-low level

D. SYSTEM FEATURES & ADVANTAGES

The Microclor[®] On-Site Hypochlorite Generation System offers maximum value measured by performance and reliability as well as capital, installation, maintenance, and operating costs. This is illustrated by the following system advantages:

1. Passive Hydrogen Removal for Superior Safety

Cells are configured in a vertical format with a recirculation loop for each cell that allows for optimized brine utilization and passive release of the hydrogen gas from each cell. Hydrogen gas is not allowed to pass from cell to cell. This design radically increases operator safety and substantially reduces the possibility of hydrogen gas build-up in the cell and the potential of catastrophic failure. Removing the hydrogen immediately from each cell eliminates the blinding of the electrodes by gas bubbles.

2. Brine Conductivity Control Optimizes Salt Efficiency

Constant current is achieved via a current feedback loop where the brine pump speed is controlled by the system programmable logic controller. This feedback loop accounts for variations in temperature, conductivity, and water flow. The titanium, Teflon impregnated gear pump is attached to a variable speed drive that continually provides a consistent blended electrolyte flow to the cells maximizing salt efficiency.

3. Indirect Constant Current

An active feedback loop which very slightly adjusts the brine flow rate achieves constant current in an indirect fashion. This innovative operational strategy eliminates the excessively high failure rate seen with forty year old switching rectifier or phase angle fired SCR voltage correction technology.

4. No Cell Internal Baffles or Gaskets

The electrolytic cells consist of thirteen internal bipolar electrodes. All anodic surfaces are coated with DSA catalytic coating. The design of the cell precludes the need for wet D.C. cable connections. There are no internal cell baffles, gaskets, or fasteners found inside the cell. The cells are built with clear acrylic guides that support the internal bi-polar plates and allow for direct visual inspection of the plates.

5. Easy Access for Maintenance

The Microclor[®] On-Site Hypochlorite Generation System is skid-mounted. The stainless steel skid construction provides superior structural strength while electrolytic polishing ensures ultimate passivation, chemical compatibility, and corrosion resistance. Use of an open frame design for the skid and a simple equipment layout facilitates access to each system component from multiple sides

for easy inspection and maintenance. The vertical cell design allows for the cell to easily be removed from the cell carrier piping by simply breaking two coupled connections. This makes for simple cell maintenance and/or replacement. Custom-designed skid configurations and equipment layouts are available.

6. Reliable Performance and Robust Construction

The robust construction of the Microclor[®] On-Site Hypochlorite Generation System allows the electrolyte feed, cells, power supply, controls, and monitoring components to be subjected to minimum stress, lowering maintenance requirements.

7. Factory-Tested

Each system is pre-assembled, piped, and wired at the factory, allowing for thorough factory-testing of not just each component, but of the entire system prior to shipment. At a minimum, a factory quality control technician shall operate and calibrate the brine feed pump, verify calibrations for the instrumentation, and test the complete control system prior to running the unit in automatic mode for a minimum of four hours.

8. Minimum Installation Cost and Time

Most parts for the Microclor[®] On-Site Hypochlorite Generation System are inventoried at the factory, reducing lead times. By skid-mounting the system, installation is quick and straightforward, with minimum time and cost. Water line, brine feed, hypochlorite solution, and electrical connections are all predetermined and are clearly indicated.

9. Proven Track Record

The Microclor[®] On-Site Hypochlorite Generation System has been in production for over ten years. This system is a fully-developed, mature product supported by an extensive list of successful installations.

E. UTILITY AND CONNECTION REQUIREMENTS

Utility and connection requirements for the Microclor[®] On-Site Hypochlorite Generation System are detailed on the enclosed Process & Instrumentation Diagram. Please do not hesitate to contact us if additional detailed information is needed.

MICROCLOR®

On-Site Hypochlorite Generation

Model		MC-100	MC-200	MC-300
Capacity Free Available Chlorine (FAC)	lbs per day	100	200	300
	kgs per day	45	90	135
Hypochlorite Produced	gal per day	1,500	3,000	4,500
	liters per day	5,680	11,355	17,035
Chlorine Concentration	w/w%	0.80 ± 0.05		
Control Panel Service (120/208-240/1/60)	amps	30	30	30
Rectifier Service (460/3/60)	amps	25	50	70
Rectifier DC Power Rating	KVA	12	24	36
<i>NOTE: Configurations available for alternate electrical power supplies.</i>				
Cell Quantity		5	5	5
Skid Materials of Construction		304 Stainless Steel, Electropolished		
Electrical Control Panel		Allen-Bradley MicroLogix 1400 PLC, Ethernet Communications, 304 Stainless Steel, NEMA 4X		
Operator Interface		6" (15 cm) Color Touchscreen HMI		
<i>NOTE: Control systems using alternate PLC platforms available.</i>				
Salt Consumption	lbs per lb FAC	2.5 – 3.5		
	kgs per kg FAC	2.5 – 3.5		
Power Consumption	kWh (AC) per lb FAC	1.8 – 2.4		
	kWh (AC) per kg FAC	4.0 – 5.3		
Water Consumption	gal per lb FAC	14.0 – 17.0		
	liters per kg FAC	117 - 142		
Ambient Air Temperature Rating ¹	°F	35 – 90		
	°C	2 – 32		
Feed Water Temperature Rating ²	°F	55 – 78		
	°C	13 – 26		
Feed Water Pressure Rating	psi	50 – 80		
	kPa	345 – 552		
Skid Dimensions (W x D x H)	in	74 x 20 x 76	74 x 20 x 76	74 x 20 x 76
	cm	187 x 51 x 193	187 x 51 x 193	187 x 51 x 193

¹Thermal management available for environments above 90 °F (32 °C).

²Heat exchangers and chillers available for feed water outside the temperature range shown.

System Approvals



Electrical Control Panel Approvals

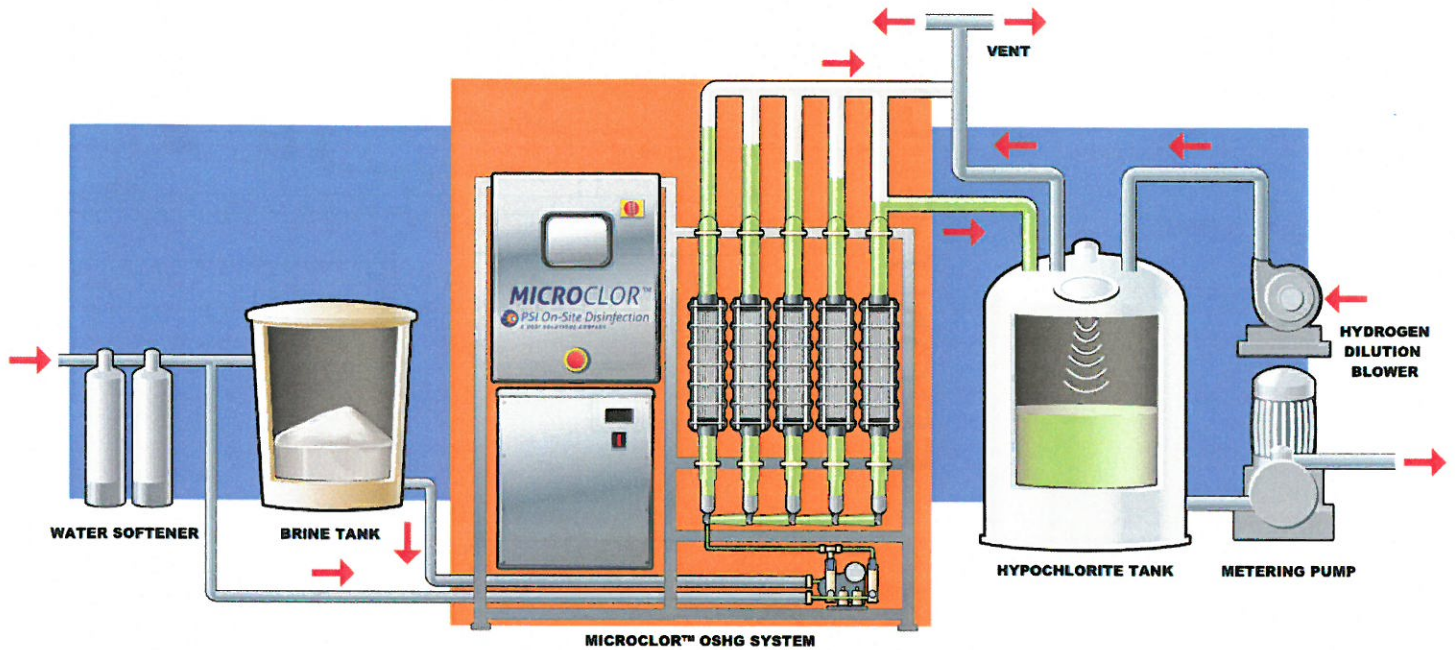
Transformer/Rectifier Approvals



MICROCLOR®

On-Site Hypochlorite Generation

Microclor® Process Flow Diagram



Microclor® MC-300 System

Features:

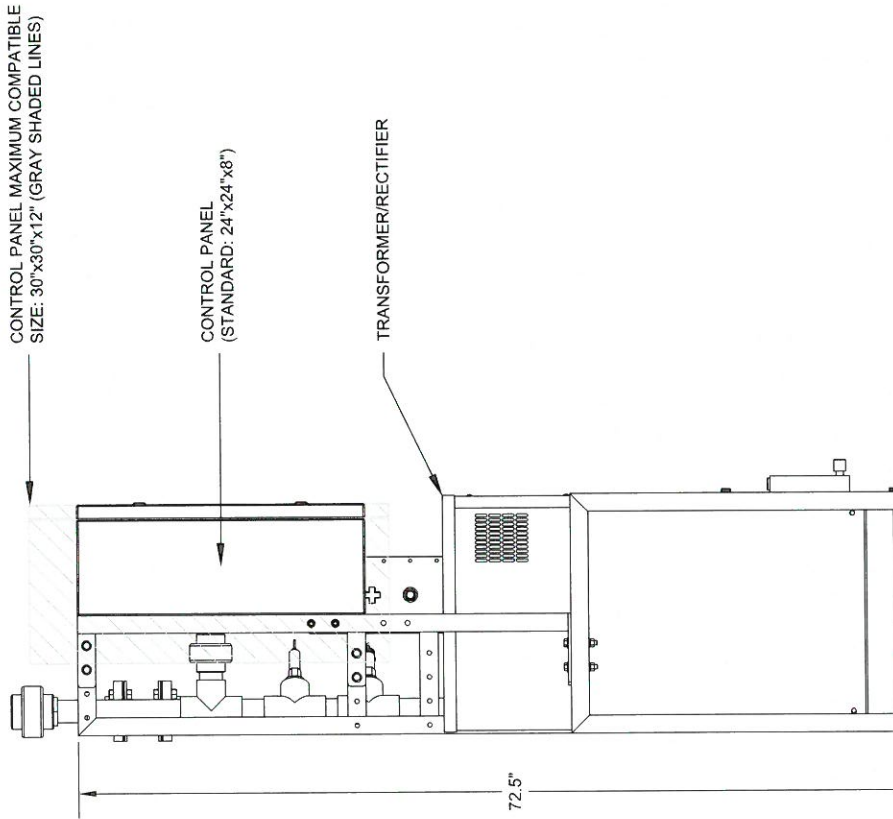
- Brine/salt tank(s), water softeners, solution tank(s), dosing pumps, and other ancillary equipment are available in various sizes to satisfy project requirements.
- System configurations available using alternate power supplies (380 VAC, 600 VAC, 50 Hz, etc.).
- Complete supply of equipment scope, system start up and installation inspection.
- Three-year warranty available.
- UL-, CE-, and CSA-Certified electrical control panel.

1 2 3 4 5

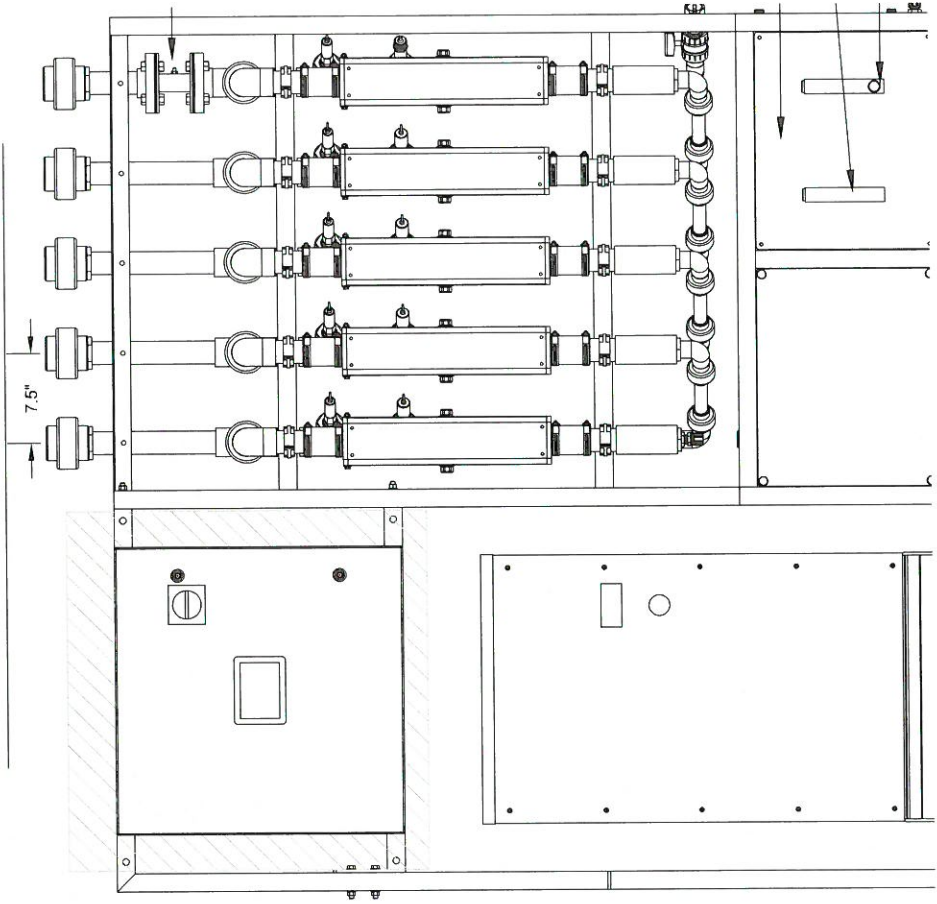
NOTES

1. WEIGHT
745 LB
2. INLETS AND OUTLETS
 A. WATER INLET FEED SIZE/MATERIAL: 1/2" PE TUBE
 B. BRINE INLET FEED SIZE/MATERIAL: 1/2" PE TUBE
 C. BRINE TANK FILL SIZE/MATERIAL: 1/4" PE TUBE
 D. VALVE VENT SIZE/MATERIAL: 1/4" PE TUBE
 E. HYDROGEN VENT RISERS SIZE/MATERIAL: 2" PVC SCH80 (INSTALLED IN FIELD)
 F. HYDROGEN HEADER SIZE/MATERIAL: 2" PVC SCH80 (INSTALLED IN FIELD)
 G. HYPO OUTLET (ON RISERS) SIZE/MATERIAL: 6-4" W x 1-8.5" D
 480VAC, 3Ø, 50A SERVICE
 19.2KVA, 300VDC, 64ADC
 REFER TO CONTROL PANEL DRAWINGS
3. FRAME BASE DIMENSIONS:
4. RECTIFIER ELECTRICAL REQUIREMENTS
5. CELL ELECTRICAL REQUIREMENTS:
6. CONTROL PANEL ELECTRICAL REQUIREMENTS:

LEFT ELEVATION



FRONT ELEVATION



A

B

C

D

E

5

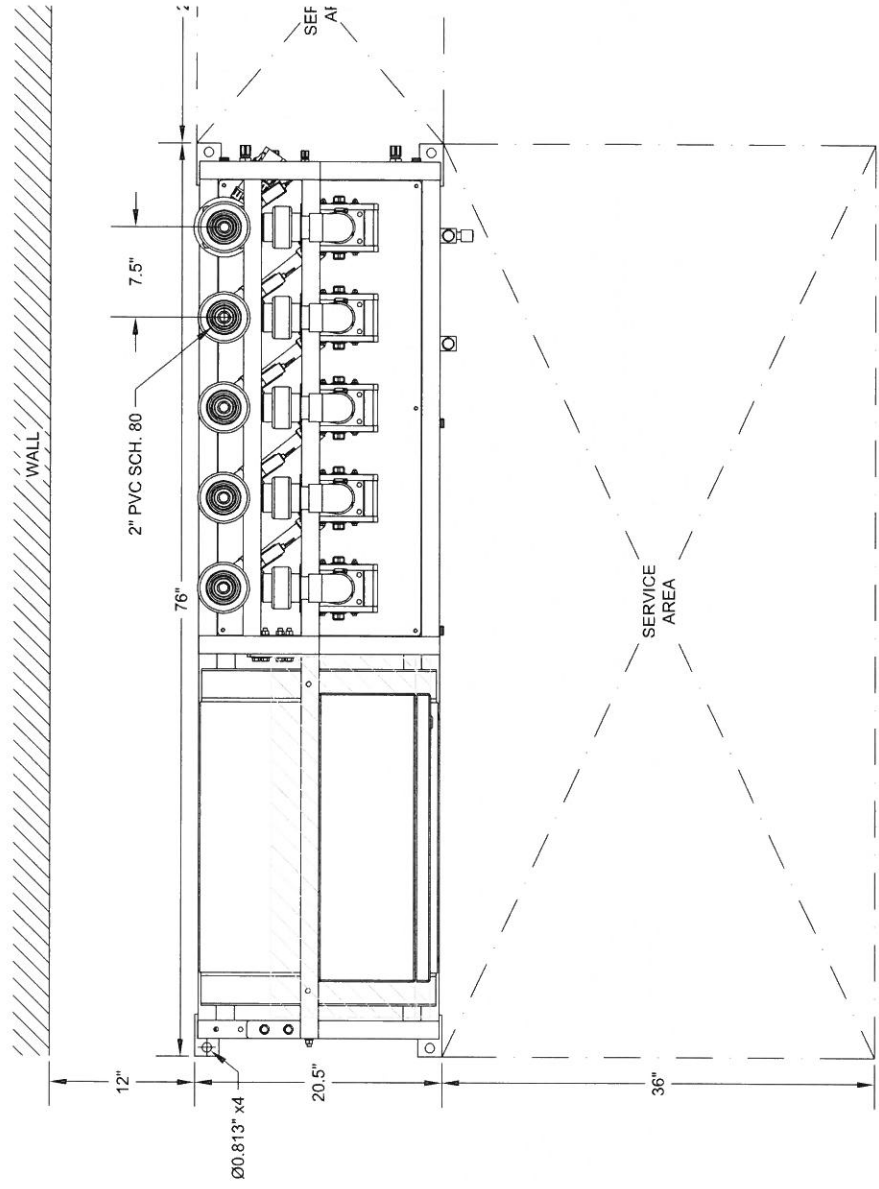
4

3

2

1

PLAN VIEW



A

B

C

D

E

A

B

C

D

E

1

2

3

4

5

PSI WATER TECHNOLOGIES, INC.
STANDARD DRAWING

MICROCLOR ON-SITE HYPOCHLORITE GENE
MC-200 (200 PPD)

PIPING & INSTRUMENTATION DIA

1

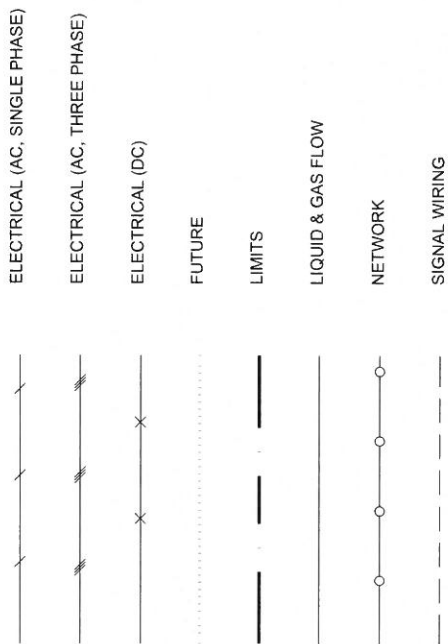
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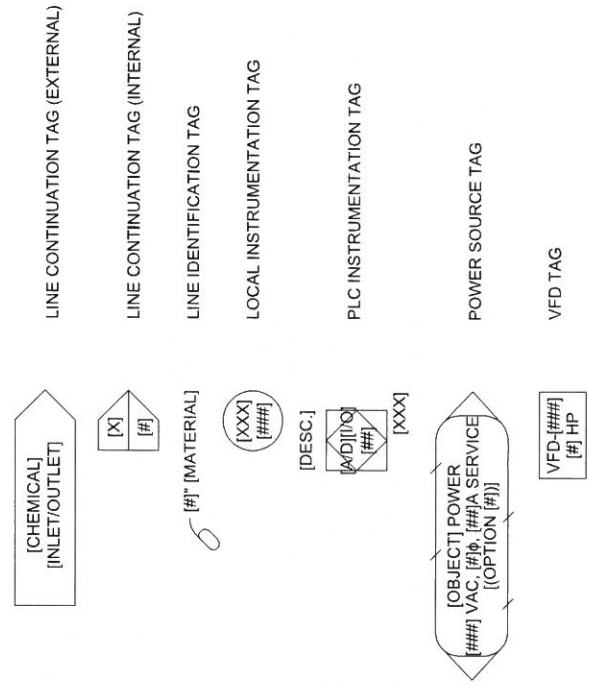
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LINE TYPES



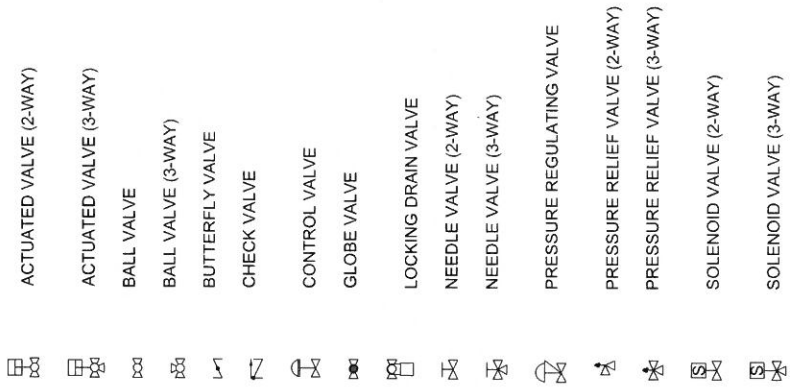
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TAGS

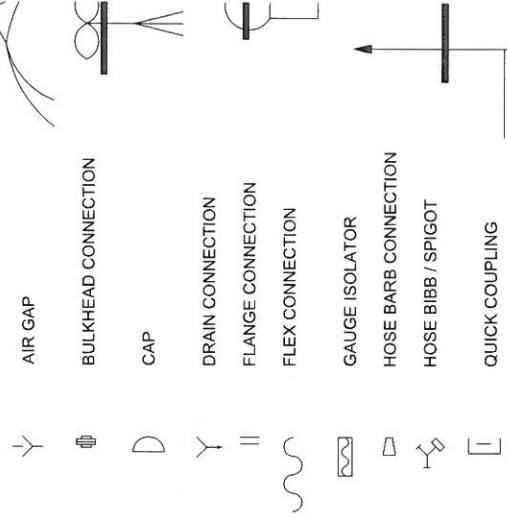


C

VALVES



FITTINGS



D

E

ISA INSTRUMENT LETTER ID

LETTER	PROCESS VARIABLE	MODIFIER	READOUT/OUTPUT FUNCTION	MODIFIER
A	ANALYZER		ALARM	
B	BURNER		USER'S CHOICE	USER'S CHOICE
C	USER'S CHOICE	CONTROL	CONTROL	CLOSE
D	USER'S CHOICE	DIFFERENTIAL		
E	VOLTAGE		PRIMARY ELEMENT	
F	FLOW			
G	USER'S CHOICE	RATIO		
H	HAND		GLASS	HIGH
I	CURRENT		INDICATE	
J	POWER	SCAN	CONTROL SITUATION	
K	TIME			
L	LEVEL		LIGHT	LOW
M	USER'S CHOICE	MOMENTARY		INTERMEDIATE
N	USER'S CHOICE		USER'S CHOICE	USER'S CHOICE
O	USER'S CHOICE		ORIFICE	OPEN
P	PRESSURE		POINT (TEST CONNECTION)	
Q	QUANTITY	INTEGRATE, TOTALIZE		
R	RADIATION	RELIEF	RECORD	
S	SPEED	SAFETY	SWITCH	
T	TEMPERATURE		TRANSMIT	

1

2

3

4

5

NOTES

- 1 PSI IS NOT RESPONSIBLE FOR ANY INTERCONNECTING TUBING, PIPING, FITTINGS, VALVES, ANCHORS, FASTENERS, OR SUPPORTS OF ANY KIND.
- 2 48" MINIMUM VERTICAL SEPARATION BETWEEN VENT HEADER (MEASURED AT LOW POINT) AND HYPOCHLORITE OUTLET (MEASURED AT HIGH POINT). MORE SEPARATION MAY BE NECESSARY IF HYPOCHLORITE OUTLET IS RAISED A
- 3 BLOWER MOUNTED 24" MAXIMUM ABOVE BASE OF GENERATOR SKID.
- 4 BLOWER REQUIRES 39" OF STRAIGHT PIPE BEFORE ANY ELBOWS OR VALVES (FOR THIS SYSTEM'S STANDARD BLOWER).
- 5 METERING PUMPS ARE SHOWN IN DUTY/STANDBY SETUP.

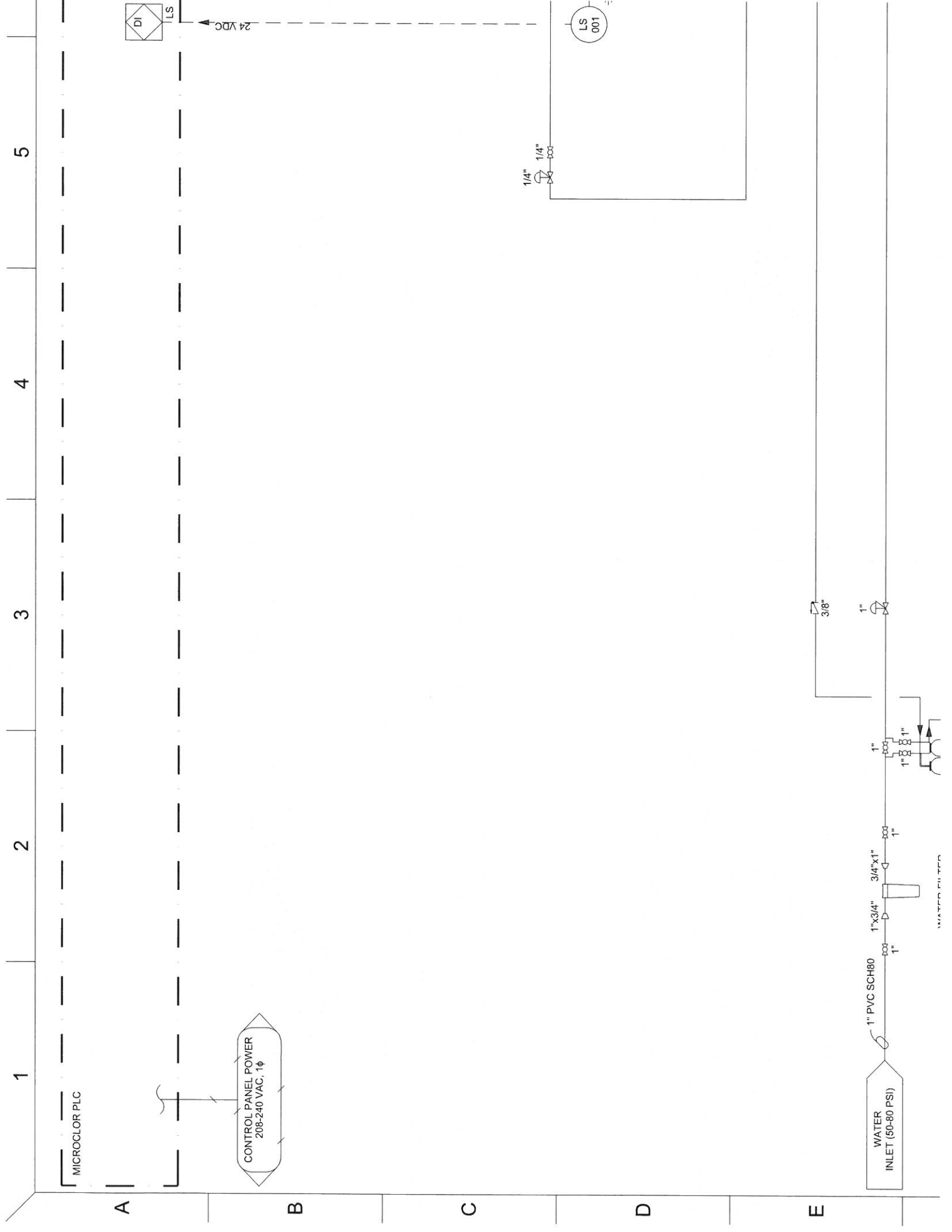
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1

MICROCLOR PLC

A



LS

24 VDC

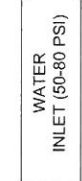


B

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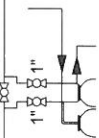
1" PVC SCH80



1"x3/4"

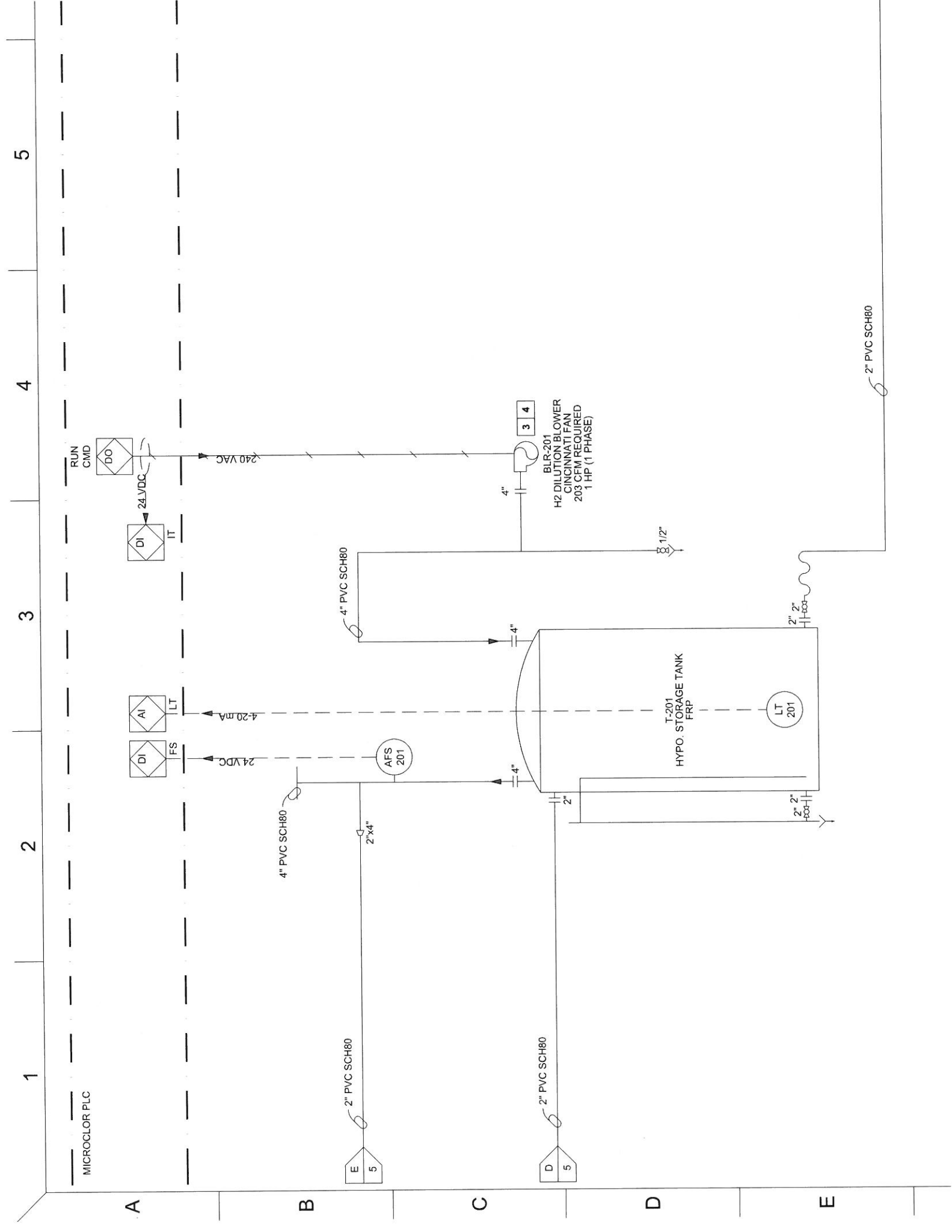


1"



WATER FILTER

E





SECTION 3

QUALIFICATIONS AND EXPERIENCE Microclor® On-Site Hypochlorite Generation System

A. Company Background

Attachments

Reference List

A. COMPANY BACKGROUND

PSI Water Technologies, Inc.'s Microclor[®] system is recognized as the leading technology in on-site hypochlorite generation (OSHG) systems for virtually all water, wastewater, and reuse applications for municipal and industrial users. A reputation for long lasting, high quality products has been established over several years of excellent performance, reliable customer service, and competitive value.

The Microclor[®] line of OSHG systems was launched by PSI Water Technologies, Inc. founders Brent Simmons and Gunnar Thordarson in 2003. Their experience with OSHG systems, however, goes back much farther as pioneers in the North American OSHG system market.

Mr. Simmons' work with commercial pool salt chlorinators inspired him to consider the utilization of on-site generation of bleach for potable water applications. Chemical Services Company (CSC) was founded in 1988 with business partner Mr. Thordarson, for the sole purpose of developing large scale chlorine generation systems. A quickly growing and profitable business, CSC developed and manufactured the ClorTec[®] chlorine generator in various sizes. After building a strong reputation as the early leading technology provider with more than 3,000 global installations, this first-generation OSHG system was acquired by Severn Trent Services in 1999. Even after supporting the ClorTec[®] line for several years, they were not finished contributing to the OSHG market.

Mr. Simmons and Mr. Thordarson satisfied several voids in the OSHG market with their formation of PSI Water Technologies, Inc.'s Microclor[®] system, the next-generation on-site hypochlorite generator. With the trust and service-focused character the founders were known for, the Microclor[®] system quickly jumped to become the industry-leading technology platform. Industry consultants and customer alike looked to PSI Water Technologies, Inc., the clear leader with 80% of the market and rapid growth internationally, to set the gold standard for safety, service, and warranty.

Shortly after defining the new generation of OSHG, the Tank Shark[®] tank mixing system was developed to effectively mix and properly dose hypochlorite into water storage vessels. After the initial Tank Shark[®] mixing model in 2007, the simple mixer has evolved capabilities into a full-blown disinfectant residual management system - the Monoclor[™] chloramine management system.

In an agreement that retained all personnel, including both founders, UGSI, Inc. acquired PSI Water Technologies, Inc. in June 2014. Seeing a great potential for growth of market volume, UGSI, Inc. management quickly invested in company resources through the addition of key general and operations management positions and the remodel of PSI Water Technologies, Inc.'s Campbell, California, headquarters and manufacturing facility. Integration with the existing UGSI sales force offers nine full-time individuals who jointly possess over 300 years combined experience selling, designing, manufacturing, installing, and servicing on-site hypochlorite generation equipment.



As a customer-focused company, PSI Water Technologies, Inc. is dedicated the following three attributes:

- a. The availability and quick shipment of on-site hypochlorite generation and tank mixing systems, and equipment replacement parts taken from its deep stock of inventory
- b. The thorough design and manufacture of innovative, pre-assembled, on-site hypochlorite generation systems that conform to the requirements of each customer and/or installation
- c. The appointing of experienced staff devoted to continuous quality improvement through further product development

PSI Water Technologies, Inc.'s parent company, UGSI Solutions, Inc. (UGSI), a private company, is a leading provider of cutting edge infrastructure technologies and PSI Water Technologies to a wide range of commercial, industrial, and governmental water and wastewater customers. UGSI meets its customers' needs through technological innovation, dedication to customer service, and an unyielding commitment to quality.

In addition to PSI Water Technologies, Inc., the UGSI portfolio consists of the following products and services:

- UGSI Chemical Feed, Inc.: PolyBlend® polymer feed systems, Encore® chemical metering pumps, dry chemical feed equipment, and the Varea-Meter® variable area flow meters
- Mobile Pipe Lining & Coating: expert applicator of corrosion inhibiting coatings and linings for steel or ductile iron pipe and fittings

Headquartered in San Diego County, California, and led by a management team with industry-leading experience and expertise, UGSI Solutions, Inc. intends to remain in the top tier of water and wastewater infrastructure and solution companies. UGSI continues to pursue complementary products and services to expand our ability to support our customers.

End User	State	Equipment	Quantity	System Replaced	Contact Name	Phone Number	E-Mail
Daphne, City of	AL	MC-100	1	Chlorine Gas	Larry English	251-621-3198	larrye@daphneutilities.com
Orange Beach Water Authority	AL	MC-400	1	New Plant	Steve Ickes	251-967-3774	steve.ickes@gmail.com
Trussville Utilities Board, City of	AL	MC-200	1	Chlorine Gas	Alan Long	205-655-3211	along@trussville.com
Olivenhain Municipal Water District	CA	MC-2400	1	Clortec	Dave Smith	760-753-6466	dmith@olivenhain.com
Rancho California Water District	CA	Various	>35	Chlorine Gas	Jake Wiley	951-296-6981	mcmahonh@ranchowater.com
Margate, City of	FL	MC-1200	1	Clortec	Wendel Wheeler	954-972-0828	wwheeler@margatefl.com
Columbus Water Works	GA	MC-500	1	New Plant	Carl Corley	706-992-6324	ccorley@cwvga.org
Indiana American Water	IN	MC-200	1	New Plant	Christopher Harrison	574-267-6232	christopher.harrison@amwater.com
Indiana American Water	IN	MC-160	1	OSEC	Brandon France	765-743-7973	Brandon.France@amwater.com
Baxter, City of	MN	MC-800	1	Miox	Kevin Cassady	218-454-5116	kevin.cassady@ci.baxter.mn.us
Burnsville, City of	MN	MC-600	2	Chlorine Gas	Linda Mullen	952-895-4552	linda.mullen@ci.burnsville.mn.us
Fairmont, City of	MN	MC-400	1	New Plant	Doug Rainforth	507-236-5840	drainforth@fairmont.org
Springfield, City Utilities of	MO	MC-1500	3	Chlorine Gas	Craig Kern	417-831-8668	Craig.Kern@cityutilities.net
Trenton, City of	MO	MC-400	1	New Plant	Steve Reid	660-359-3211	sreid@trentonmo.com
Spartanburg Water Systems	SC	MC-1000	2	New Plant	Jim Tester	864-598-7257	jttester@spartanburgwater.org
Portland, City of	TN	MC-300	1	Miox	Tim Suddarth	615-325-3915	portwtp@cityofportlandtn.gov
Midlothian, City of	TX	MC-1200	1	New Plant	Tim Walker	972-775-6663	tim.walker@midlothian.tx.us
Upper Trinity River Authority	TX	MC-2000	3	Pepcon	Tim Brazile	940-453-5579	Not available
Salt Lake City Public Utilities	UT	MC-600	2	12% Hypochlorite	Bill Myer	720-238-3963	Not available
Washington County Conservancy District	UT	MC-600	2	12% Hypochlorite	Brie Thompson	435-673-3617	briethompson@wcwcd.utah.gov
Clark Public Utilities	WA	MC-300	1	Clortec	Steve Prather	503-285-9141	dcharlson@clarkpud.com
Cheyenne, City of	WY	MC-100	1	Tablet Feeder	Lynn Gaer	307-632-9893	lgaer@cheyennebopu.org



SECTION 4

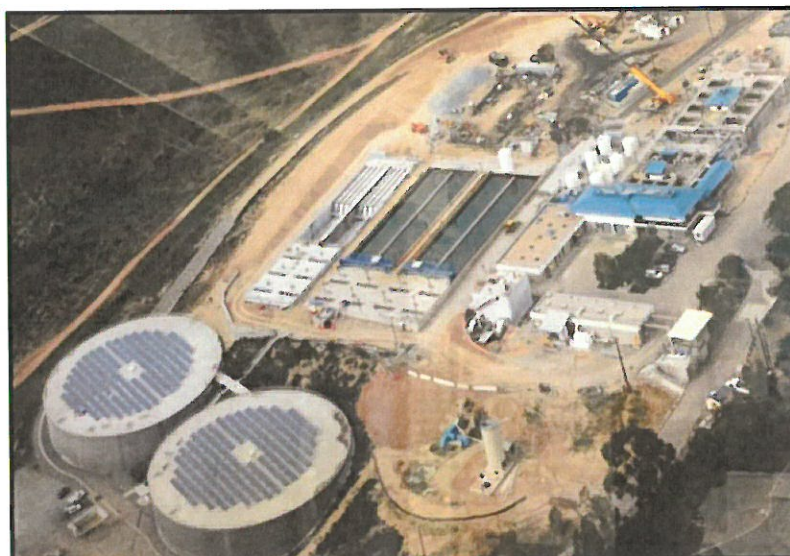
CASE STUDIES

Microclor® On-Site Hypochlorite Generation System

City of San Diego Water Plant Switches from Chlorine Gas to On-Site Hypochlorite Generation to Reduce Risks, Improve Safety and Decrease Costs

Generating Sodium Hypochlorite On-Site Provides the Strength and Consistency Required for Powerful Disinfection

Located in southern San Diego County, the Otay Water Treatment Plant, with a capacity of 34 million gallons per day (MGD), provides drinking water to an estimated 100,000 customers. The plant is operated by the City of San Diego and located less than two miles from the United States – Mexico border, north of Tijuana. Despite being 15 miles from the Pacific Ocean, the arid region is considered part of the Colorado Desert and receives an average of only ten inches of rain each year.



With virtually no local water sources available for use, the City of San Diego relies on water from the Metropolitan Water District, which imports its water from the Colorado River and the California State Water Project. The two massive water projects bring water from other watersheds and regions hundreds of miles to the north and east.

Constructed as a conventional treatment plant, the Otay Water Treatment Plant used chlorine dioxide produced from chlorine gas for disinfection as the incoming water was high in naturally occurring organic matter. While the use of chlorine gas provided a strong disinfectant for the treated water, operators with the City began to consider other disinfection options as the area surrounding Otay grew and expanded. Given the residential encroachment around the plant, the City wanted to find safer alternative sources of chlorine. Senior Water Operations Superintendent, Jim McVeigh was forward-leaning in seeking innovative technologies to provide safer, more sustainable water disinfection for the community.

The City's multiple treatment plants in the region routinely stored between 20 and 40 tons of chlorine gas at each facility in one-ton pressurized cylinders. Each plant's safety facilities were equipped to neutralize a maximum of one ton of released chlorine. This meant the risk of an uncontrolled release of tens of thousands of pounds of chlorine was possible, with a danger zone extending 20 miles downwind from a release site. Heightened concerns around terrorism over the past several decades have brought increased safety reporting and training requirements for water districts across the country. In California, the use of chlorine gas requires registration through the California Accidental Release Prevention

(CalARP) program which includes a rigorous Risk Management Plan, as well as on-site safety audits. Storage of chlorine gas is also recognized by the Federal Department of Homeland Security as a potential terrorist target.

When the City of San Diego embarked on an upgrade of the Otay Treatment Plant, reducing risk and simplifying operations were top priorities. City officials, along with their engineers, evaluated several alternative disinfection scenarios, including: keeping the chlorine gas system operating as is; upgrading the existing chlorine gas system; converting to commercial strength sodium hypochlorite; converting to on-site generation of chlorine gas; and converting to on-site generation of sodium hypochlorite (created by using electricity to turn table salt into a 0.8% free chlorine solution).



A net present value (NPV) analysis comparing trucked-in commercial strength sodium hypochlorite and installation of an on-site sodium hypochlorite generation (OSHG) system was conducted in order to evaluate the combined long-term capital and operating costs of the respective options. The analysis included risks and hazards associated with minor and catastrophic chlorine gas releases as cost factors. A major drawback to the use of bulk hypochlorite (approximately 12.5% concentration) was the anticipated frequency of truck deliveries through the community, which includes an

Olympic athlete training center near the treatment plant. The safety and reliability of the OSHG system was appealing from the standpoint of reducing the overall risk to the community, simplifying operations and reducing safety training requirements. In the end, the NPV calculation confirmed that OSHG was the most cost-effective solution based on overall risk reduction and capital and operating costs.

Once City officials decided on the Microclor® OSHG system, they worked with the engineers at PSI Water Technologies (PSI) in Campbell, California to design a system for the new treatment plant processes. The OSHG system was sized with redundancy to include two 1,000 pound-per-day chlorine generation skids. The design also included bulk hypochlorite dilution panels which aided in start-up, as well as providing further redundancy of disinfectant supply.

PSI provided project management support during the construction phase, as well as training, start-up, and commissioning of the new secondary disinfection system, which utilizes sodium hypochlorite generated on-site and liquid ammonium sulfate (delivered to the site) to create monochloramines. Since start-up, Otay Water Treatment Plant operators have observed numerous measurable advantages with the new system. The 0.8% sodium hypochlorite (bleach) produced by the Microclor® OSHG system is less reactive and more stable over time, versus highly concentrated bulk bleach. This steady source of consistent-quality sodium hypochlorite has improved control of the chlorination

www.4psi.net

process, eliminated backwash chlorine spikes and reduced THM formation at the plant. In addition, the switch to OSHG means the City is no longer required to register with the CalARP program, saving hundreds of staff hours previously dedicated to compliance, reporting, training and audits.

Thanks to the Microclor® OSHG system, the City of San Diego's Otay Water Treatment Plant now has a safe and reliable source of chemical disinfection that has simplified operations.

"We now have safer and more reliable disinfection and have eliminated our CalARP risk management program requirements."

Patrick Boyd, Senior Water Operations Supervisor, City of San Diego Water Department



SECTION 5

BROCHURES

Microclor® On-Site Hypochlorite Generation System



PSI Water Technologies
A UGSI SOLUTIONS COMPANY

MAKING BLEACH MADE EASY

MICROCLOR[®]

On-Site Sodium Hypochlorite Generation

Making Bleach Makes Sense

Microclor® OSHG On-Site Hypochlorite Generation (OSHG) is the safe, sound, clean & green disinfection option.



Microclor® MC-40, 40 Pounds Per Day

As concerns mount and regulations change regarding the safety and security of using chlorine gas for water disinfection, many utilities are choosing sodium hypochlorite (bleach) as a safer disinfection alternative. Once the decision to convert to a safer alternative has been made the question remains whether to purchase or produce sodium hypochlorite. Microclor® OSHG is the right choice to meet your disinfection requirements. The items listed below are the most significant of the many benefits realized by upgrading to Microclor® OSHG. We encourage you to contact the many utilities currently using Microclor® OSHG for further evidence supporting the decision to purchase a Microclor® OSHG.

Safety

Microclor's® OSHG dilute (0.8%) hypochlorite solution is below most hazardous material concentration thresholds of 1%. This reduces operator HazMat exposure and eliminates the need for diluting commercial hypochlorite to compensate for degradation which results in inconsistent solution strength.

Fewer Deliveries

The only raw materials required for the OSHG process are salt and water. This will reduce vendor deliveries by about 66% compared to commercial bulk hypochlorite. Less truck traffic through the community and at the facility will reduce the potential for accidents and eliminate the associated carbon footprint. This furthers efforts towards Green Facility Management and improves the water security profile.

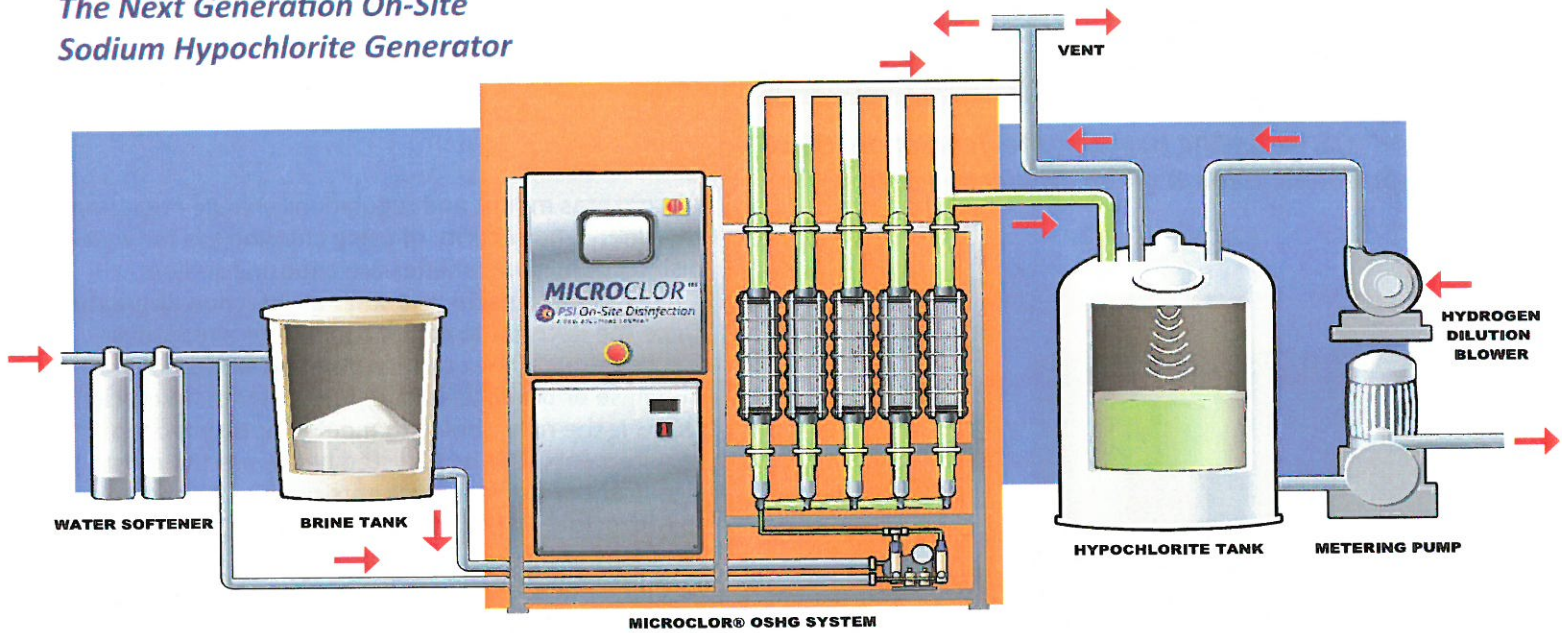
Continuity of Operations

Microclor® OSHG will enable storage of larger quantities of raw materials (salt) necessary for your disinfection process. This will result in a more sustainable and robust treatment facility better able to withstand the demands imposed by a natural disaster or health emergency.

Reduced Operational Costs

Since all chlorine compounds are derived from salt, electrolytic conversion on-site will result in significant savings to the owner. Typically, it costs 50-70% less to produce sodium hypochlorite as compared to buying it.

The Next Generation On-Site Sodium Hypochlorite Generator



Microclor® OSHG is modular in design and utilizes standard components which are easily customized to meet a wide range of requirements.

A typical Microclor® OSHG system includes:

- Stainless Steel Skid Assembly
- Water Softener
- Brine Tank
- Brine Pump
- Electrolytic Cells
- Skid-mounted PLC Control Panel
- D.C. Rectifier
- Hypochlorite Storage Tank
- Hypochlorite Metering Pump
- Hydrogen Dilution Blower

Capacities: 20-2400 pounds per day chlorine equivalent
Control: Automatic, regulated by storage tank level
Percentage Sodium Hypochlorite: 0.8% +/- 0.05%*
Consumables per Pound of Chlorine Produced: ~ 2.5-3.5 lbs salt, 1.8-2.4 kWh(AC), 14.0-17.0 gallons water
Water Input: Potable water, 50-80 PSI, 55°F-78°F (13°C-25°C)
Salt: 99.7% pure dry weight Morton White Crystal or equivalent
Power: 208V/240V, 1 Ph: 20-60 ppd; 208V, 3 Ph: 40-80 ppd; 480V, 3 Ph: 20-2400 ppd
Control Cabinet: 304 stainless steel NEMA 4X
Operator Interface: 6" color touchscreen
Programmable Logic Controller: Allen Bradley® MicroLogix™ 1400

* Actual performance may differ in systems with less than five cells with operating conditions outside the norm

Microclor® OSHG Product Parameters

	Capacity				Total Flow		Brine Flow		Water Flow		Incoming Power Ratings (FLA)					
	PPD	KgPD	FORMAT	CELL	GPM	LPM	GPM	LPM	GPM	LPM	208V/1Φ	240V/1Φ	208V/3Φ	380V/3Φ	480V/3Φ	600V/3Φ
MC-20	20	9	1X20	2X12	0.2	0.8	0.02	0.1	0.18	0.7	13	11	7	4	3	2
MC-40	40	18	2X20	2X12	0.4	1.5	0.04	0.2	0.36	1.4	26	22	14	8	6	5
MC-60	60	27	3X20	2X12	0.6	2.3	0.06	0.2	0.54	2.0	39	33	21	12	9	7
MC-80	80	36	4X20	2X12	0.8	3.0	0.08	0.3	0.72	2.7			28	15	12	10
MC-100	100	45	5X20	2X12	1	3.8	0.10	0.4	0.90	3.4				19	15	12
MC-160	160	73	4X40	4X12	1.6	6.1	0.16	0.6	1.44	5.5				31	24	19
MC-200	200	91	5X40	4X12	2	7.6	0.20	0.8	1.80	6.8				38	30	24
MC-300	300	136	5X60	6X12	3	11.4	0.30	1.1	2.70	10.2				58	46	37
MC-400	400	182	5X80	8X12	4	15.1	0.40	1.5	3.60	13.6				77	61	49
MC-500	500	227	5X100	10X12	5	18.9	0.50	1.9	4.50	17.0				96	76	61
MC-600	600	273	5X120	12X12	6	22.7	0.60	2.3	5.40	20.4				115	91	73
MC-800	800	364	5X160	12X16	8	30.3	0.80	3.0	7.20	27.3				154	122	97
MC-1000	1000	455	5X200	12X20	10	37.9	1.00	3.8	9.00	34.1				192	152	122
MC-1200	1200	545	5X240	12X24	12	45.4	1.20	4.5	10.80	40.9				231	183	146
MC-1600	1600	727	10X160	12X16	16	60.6	1.60	6.1	14.40	54.5				307	243	195
MC-2000	2000	909	10X200	12X20	20	75.7	2.00	7.6	18.00	68.1				384	304	243
MC-2400	2400	1091	10X240	12X24	24	90.8	2.40	9.1	21.60	81.8				461	365	292

Making Bleach Made Easy

The safety and cost effectiveness of On-Site Hypochlorite Generation makes it the best option for disinfecting water.

Since 1988 On-Site Hypochlorite Generation has been recognized as an effective method for disinfection of water. Process Solutions, Inc. has dramatically improved the technology into the robust and reliable design of the patented (www.psipatents.com) Microclor® OSHG system.

The patented Microclor® OSHG design is the result of over twenty-five years of experience in the manufacturing, installation and servicing of hypochlorite generation equipment. Advancements in system safety and ease of operation make Microclor® OSHG the overwhelming choice for water treatment professionals.

The combined benefits of the following unique features make Microclor® OSHG the most resilient and durable system available today:

- Vertical Cell Arrangement
- Multiple Cell Configuration
- Direct Hydrogen Management
- Continuous Process Control
- Full-Wave DC Power
- Compact Cell Design
- High-Velocity Electrolyte Circulation

VERTICAL/MULTI CELL CONFIGURATION

The Microclor® OSHG vertical cell arrangement is the most significant of the many features that distinguish it from the earlier generations of equipment.

DIRECT HYDROGEN MANAGEMENT

The electrolytic cells are configured in a vertical array and vented directly to atmosphere. This prevents the chance of overpressurization by releasing all hydrogen directly from each cell. Other systems use the storage tanks as hydrogen separators which can contribute to excessive cell pressure and vibration in the discharge piping.

CONTINUOUS PROCESS CONTROL

Microclor's® OSHG integral brine pump is controlled by the PLC to optimize salt conversion efficiency and hypochlorite production. Automating precise brine control reduces operator intervention and improves system effectiveness.

FULL-WAVE DC POWER

Automated brine control allows full-wave rectification which greatly reduces excess heat and the number of components necessary in the rectifier. This reduces facility HVAC loads and improves system reliability.

COMPACT CELL DESIGN

The cell's vertical orientation not only allows better hydrogen separation but is also more compact, resulting in a more space-efficient footprint. The clear acrylic cell body supports the electrode array and eliminates the need for internal baffles and fasteners, reducing maintenance and repair costs over the life of the system.

HIGH-VELOCITY ELECTROLYTE CIRCULATION

The hydraulic lift created by the hydrogen separation circulates electrolyte through the cell loop at 3 fps. This reduces the requirement for cell cleaning and minimizes heat accumulation in the cell.



Microclor® MC-1000, 1,000 Pounds Per Day

Making Bleach Made Easy

“ The simplicity of the Microclor® OSHG system never ceases to impress me. Based on my prior experience with on-site hypochlorite generation, I never knew a system could be so easy to operate and maintain. Love it. ”

*Leo Williams, Mountain Regional Water SSD
Operations Superintendent*



Advantages:

- Safest OSHG Design
- Low-Cost, Stable Hypochlorite
- Vertical Cell Design
- Multi-Cell Configuration
- Immediate/Continuous Hydrogen Removal
- No Hydrogen Containment
- Small Footprint
- Low-Maintenance
- 24-Hour Service

Service and Support

Process Solutions provides world class service and technical support for its line of Microclor® OSHG products. Spare parts, peripheral components, troubleshooting advice and field service are all elements of a robust customer orientation that Process Solutions possesses to ensure that our customers are “making water”.



LEARN MORE ABOUT Microclor® OSHG
www.4psi.net



Microclor® LC-40S, 40 Pounds Per Day



Process Solutions, Inc.
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Toll Free: (888) 774-4536 (PSI HELP)
Tel: (408) 370-6540 | Fax: (408) 866-4660
Email: mail@4psi.net | www.4psi.net
Rev. 2 07/2017



