2015-4130
2016-08-09

(Device/ Unit Label)

SONOXIDE™ B-70
ULTRASONIC WATER TREATMENT SYSTEM

REGISTRATION NO: **28760** PEST CONTROL PRODUCTS ACT

COMMERCIAL

WARNING

READ THE LABEL AND SONOXIDETM B SYSTEM START-UP, OPERATIONS AND MAINTENANCE MANUAL BEFORE USING

KEEP OUT OF REACH OF CHILDREN AND/OR UNAUTHORIZED PERSONNEL

SEE SIDE PANEL FOR ADDITIONAL PRECAUTIONARY STATEMENTS

Solenis Canada ULC
942 Brant Street
Burlington, ON L7R 2J7
Telephone: 1-905-632-7861
Emergency Telephone: 1-844-SOLENIS (1-844-765-3647)

FOR USE IN CONTROLLING BACTERIA, ALGAE, MOLD AND BIOFILMS IN COMMERCIAL & INDUSTRIAL RECIRCULATING COOLING SYSTEMS AND AUTOMOTIVE PROCESS WATER SYSTEMS.

DIRECTIONS FOR USE:
Fouled systems must be cleaned before treatment is begun. SONOXIDE™ B-70 ultrasonic water treatment systems utilize ultrasonic wave technology for the control of bacteria, algae, mold and biofilm in Commercial & Industrial recirculating cooling systems and Automotive process water systems.
SONOXIDE™ B-70 systems must be installed and pre-qualified for operational safety prior to start-up by a qualified technician. Operator training is required prior to working with SONOXIDE™ B-70 systems. When operating, the storage cabinet doors should be closed.

METHOD OF APPLICATION: The ultrasonic wave technology is applied as water passes through the ultrasonic treatment cell. Continuous flow through the unit is required, facilitating a minimum of four system volume throughputs passing through the SONOXIDE™ B- 70 system in a 24 hour period. As water continues to pass through SONOXIDE™ B-70 system, bacteria, algae, mold and biofilm present in the water and throughout the system are controlled.

UNIT SIZING: The SONOXIDE™ B-70 system is designed to work within a system having a volume of 45-95 cubic metres. The flow rate through the unit is to be 15.5 cubic metres per hour. See Start-up, Operations and Maintenance manual for additional model information.

REQUIRED SYSTEM MAINTENANCE: Refer to start-up, operations and maintenance manual for instructions for required maintenance of components of the ultrasonic treatment cell, and air eduction components of the SONOXIDE™ B-70 system.
SYSTEM SHOULD BE CHECKED DAILY WHEN OPERATING, see operations and maintenance manual for the appropriate parameters.

STORAGE: SONOXIDE™ B-70 systems must be protected from freezing and operated at ambient temperatures. If freezing is a possibility the unit must be equipped with optional Heater Package and supply lines heat traced. SONOXIDE™ B-70 system areas must be free of debris, combustible, and hazardous materials. Adequate space for service and maintenance must be provided. Appropriate temperature and airflow must be provided in operating areas to prevent overheating of the unit. Review all building, fire, and safety codes prior to installation. Strict adherence to local, provincial and federal guidelines and laws, as well as in-plant safety rules is required. Disconnecting SONOXIDE™
B-70 system requires the assistance of a qualified technician. Refer to start-up, operations and maintenance manual for additional information.

FIRST AID:
Cooling or process water contacting the eyes: Flush eyes with water for 15 minutes. Hold eyelids apart to ensure rinsing. Seek medical attention.

Electrical Shock: Do not touch person until the electrical source is removed. Once the electrical source is removed, check person for breathing. If the person is not breathing or unconscious, call 911 or an ambulance then begin CPR until medical personnel arrive.

Electrical Burn: Cover burns with sterile gauze and seek medical attention.

Take the label or product name and Pest Control Product Registration Number with you when seeking medical attention.

PRECAUTIONS: KEEP OUT OF REACH OF CHILDREN AND/OR UNAUTHORIZED PERSONNEL
Read the Start-up, Operations and Maintenance manual prior to SONOXIDE™ B-70 system start-up. Understand all warning and instructions before operating SONOXIDE™ B-70 system.

WARNING: UNIT PRESENTS A POSSIBLE ELECTRICAL SHOCK HAZARD. CLOTHING SHOULD FIT SNUGLY TO AVOID DANGER OF BECOMING ENTANGLED IN MOVING MACHINERY. RECOMMENDED SAFE WORK CLOTHES INCLUDE: HARD HAT, EAR PLUGS, GOGGLES, TIGHT SLEEVES AND TROUSER LEGS, SAFETY SHOES, NO RINGS ON FINGERS OR WATCHES (CONDUCTORS OF ELECTRICITY). DO NOT ATTEMPT TO ADJUST ANY WORKING PARTS OF SONOXIDE™ B-70 SYSTEMS WHEN THE UNIT IS OPERATING. NEVER ATTEMPT TO ADJUST ANY PART OF THE ULTRASONIC CHAMBER EXCEPT FOR PRESCRIBED MAINTENANCE USING A QUALIFIED TECHNICIAN.

ENVIRONMENTAL HAZARDS: It is critical that all SONOXIDE™ B-70 systems be installed by a qualified technician in order to meet all electrical requirements and to prevent water leakage prior to the start of operation.

PHYSICAL AND CHEMICAL HAZARDS: Physical hazards associated with SONOXIDE™ B-70 systems include electrical shock, slip hazards due to unplanned system leakage, and hazards due to moving parts when the system is in operation (pump). Electrical power must be removed when electrical equipment is inspected, serviced, or repaired.

NOTICE TO USER: This pest control product is to be used only in accordance with the directions on the label. It is an offence under the *Pest Control Products Act* to use this product in a way that is inconsistent with the directions on the label. The user assumes the risk to persons or property that arises from any such use of this product.

(Manual)

SONOXIDE®
Ultrasonic Water Treatment System

Installation, Start-up, Operations and Maintenance Manual

Solenis
Wilmington, DE
(302)-594-5000

Models:

Sonoxide B-15 Reg. No. 28757
Sonoxide B-33 Reg. No. 28207
Sonoxide B-70 Reg. No. 28760
Sonoxide B-106 Reg. No. 28758
Sonoxide B-154 Reg. No. 28759
Sonoxide B-300 Reg. No. 28756

This Manual is written for use with UL / CSA approved systems for CANADA ONLY.

Important Information – Read Before Continuing

This manual contains critical information needed to safely and effectively install, start up, operate and maintain the Sonoxide™ system. It is designed to familiarize you with the necessary requirements for Sonoxide system start-up and subsequent operations. You will find that Sonoxide ultrasonic treatment system is a turn-key, self-contained unit requiring minimal maintenance or operator interface.

Please be advised that Solenis Sonoxide Equipment Manager is your resource for additional questions or troubleshooting (Steve Petrillo - 973-874-0162, cell 201-841-3106, or sjpetrillo@solenis.com).

Loose connections may occur during shipping due to vibrations. It is recommended that all wiring be checked and re-secured if found loose to avoid damage to the unit upon electrical start up.

VERY IMPORTANT - For all suction lift applications, be sure to have plant install a water fill port in the suction line to help prime the pump AND a non return foot valve on the end of the suction line.

VERY IMPORTANT – For all installations, Supply water piping requires a minimum distance of 8 to 10 pipe diameters of straight pipe (sans restrictions) into the pump impeller section.

It's critical to do a biofilm clean up procedure of the system prior to Sonoxide treatment being initiated. The need and type of cleaning procedure required to accomplish this will vary. The following will help:

Technical Bulletin: Pre-Cleaning Needs Assessment of Cooling Water Systems
Technical Bulletin: Sonoxide Pretreatment Procedure
Technical Bulletin: Biofilm and Organic Fouling Removal Using Peroxide/Caustic

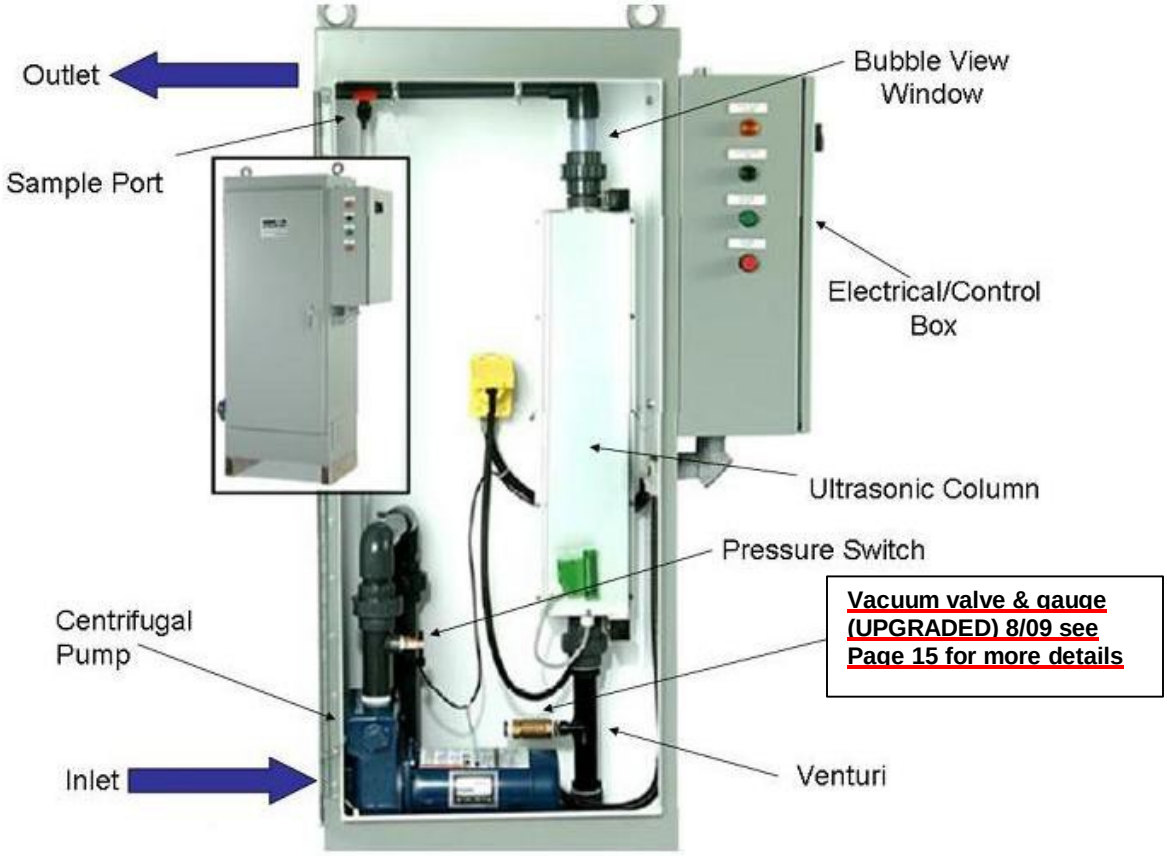
Cooling towers with distribution decks exposed to direct sunlight should be covered. The volume of water in any distribution deck should be properly balanced from the distribution header(s) and have 3" to 4" in depth to ensure proper water flow and distribution not only on the deck but over the fill. Ignoring this will result in salt / ice zones within the fill.

TABLE OF CONTENTS

Section 1 – Sonoxide System Checklist

The Sonoxide Ultrasonic System is supplied pre-piped and pre-wired. The installer is required to bring power to the electrical cabinet and system water to be treated to the inlet of the cabinet and a return line of the treated water back to the system. Figure 1 illustrates the Sonoxide unit as shipped. Plumbing, mechanical, and electrical drawings are supplied in a separate package and can be found on the inside of the door panel of the Sonoxide cabinet. Installation instructions associated with the drawings are found in this manual.

Figure 1



Installation

Installation needs for Sonoxide system are basic and the guidelines need to be strictly followed. This manual contains drawings and documentation regarding location, plumbing, electrical and technical support. For questions regarding installation, contact our Sonoxide Equipment Manager, Steve Petrillo, 973-874-0162, cell 201-841-3106, or sjpetrillo@solenis.com.

General Considerations

Microbiological control of the cooling water system depends on the Sonoxide treatment suppressing the intrinsic microbiological activity of the system. A primary parameter for successful microbiological control with Sonoxide is the distribution of the circulation across the system.

The Sonoxide treated water must circulate throughout all sections of the system.

Consideration should be given to prevent drawing and discharging the Sonoxide treated water in such a manner as to short-circuit the system volume that is recirculated. For example, Sonoxide supply water is typically drawn from one corner of the tower sump into the Sonoxide unit and discharged at the opposite corner.

The Sonoxide discharge should be located such that it is within proximity of the inlet of the process loop to facilitate flow of Sonoxide treated water through the exchangers.

When multiple Sonoxide units are used to treat a single system, preference should be given to distributing the individual discharges across the system rather than discharging them to a common location.

a. Location

Before physically placing the Sonoxide unit, be aware of the engineering limitations on supply and discharge line length (Figures 2 and 3 on pages 8 and 9), height of water lift to pump, and height of water discharge return to the system (Table 1 on page 10), and number of elbows as discussed in the Plumbing section of this manual.

The Sonoxide unit should be set on a concrete pad or other stable platform. Indoor location is preferred, but outdoor is acceptable.

It is best to locate the Sonoxide unit where in the pump is lower than the supply point from the system resulting in a flooded suction configuration.

If located outdoors and winter freezing is a concern, the unit should be supplied with internal cabinet heaters from the factory. These can be added separately. Freezing is typically only a concern if the unit shuts off during cold conditions as discussed in the Heaters for Freeze Protection section of this manual.

Inlet and outlet lines need to be heat traced in cold climate environments.

It is recommended that a tee with a ball or drain valve be inserted at the lowest point in the piping leading into the column for manual drainage during column changeouts.

b. Plumbing

NOTE: See the plumbing installation diagrams on pages 8 and 9.

Supply water piping should be 1 pipe size larger than the inlet connection of the pump. If the inlet of the pump is 5 cm (2") the supply line should be 7.6 cm (3"). If the incoming pipe is larger, it will need to be stepped down in size at the pump to make the final connection. Pipe should not be longer than 9 m (30 ft.) without first discussing with your Sonoxide Equipment Manager.

Supply water piping should have no more than (4) 90 degree elbows. 45 degree is better.

Supply water piping requires a minimum distance of 8 to 10 pipe diameters of straight pipe (sans restrictions) into the pump impeller section.

Suction lift applications have specific limitations on height of lift from water level to pump centerline. Please refer to Figure 2 (page 8) and / or Table 1 (page 10).

Suction lift applications need a water fill port and a non return foot valve installed on the supply line (water fill port as close to pump as possible, foot valve at end of suction line).

The supply water line should have either an inline basket strainer or foot valve screen to prevent pump fouling due to string, stickers, labels, leaves and other moderately large particles. Opening size should be minimum 0.3 cm (1/8") and maximum 0.95 cm (3/8"). If either device is installed, it should be able to be accessed for cleaning.

Basket Strainer

Foot Valve Screen

A constant inlet water pressure is provided to the unit by the centrifugal pump inside the cabinet.

If the water supply to the unit has a varying pressure and exceeds 207kPa (30 psi), the pressure needs to be reduced through the installation of an acceptable pressure reducing valve. Please contact our Sonoxide Equipment Manager for further instructions.

If the water supply to the unit has a varying pressure and is less than 207kPa (30 psi), this may result in pump cavitation, please contact our Sonoxide Equipment Manager for further instruction.

If pipe taps are installed to supply water to the Sonoxide system, these taps and valves must be fully ported. Ported means that a 5 cm (2") size valve has 5 cm (2") orifice through the valve body to support the necessary flow.

Discharge plumbing should be as large or larger than the outlet of Sonoxide unit piping. See Table 1, page 10 for pump inlet/outlet dimensions and Figures 2 and 3 on pages 8 and 9 for plumbing configurations. Discharge piping should be plumbed so that water discharges atmospherically to the system. Piping should not be returned to another water pipeline or be discharged under the basin water surface without prior discussion with our Sonoxide Equipment Manager.

Discharge piping should not rise vertically more than that stated in Figures 2 and 3 (pages 8 and 9) and in Table 1, page 10.

Discharge plumbing should be returned a minimum of 3 m (10 ft.) away from the Sonoxide unit inlet suction. Most basins for recirculating water systems have a direction of flow toward the recirculation pumps. Sonoxide unit supply water suction should be located upstream of the Sonoxide unit discharge.

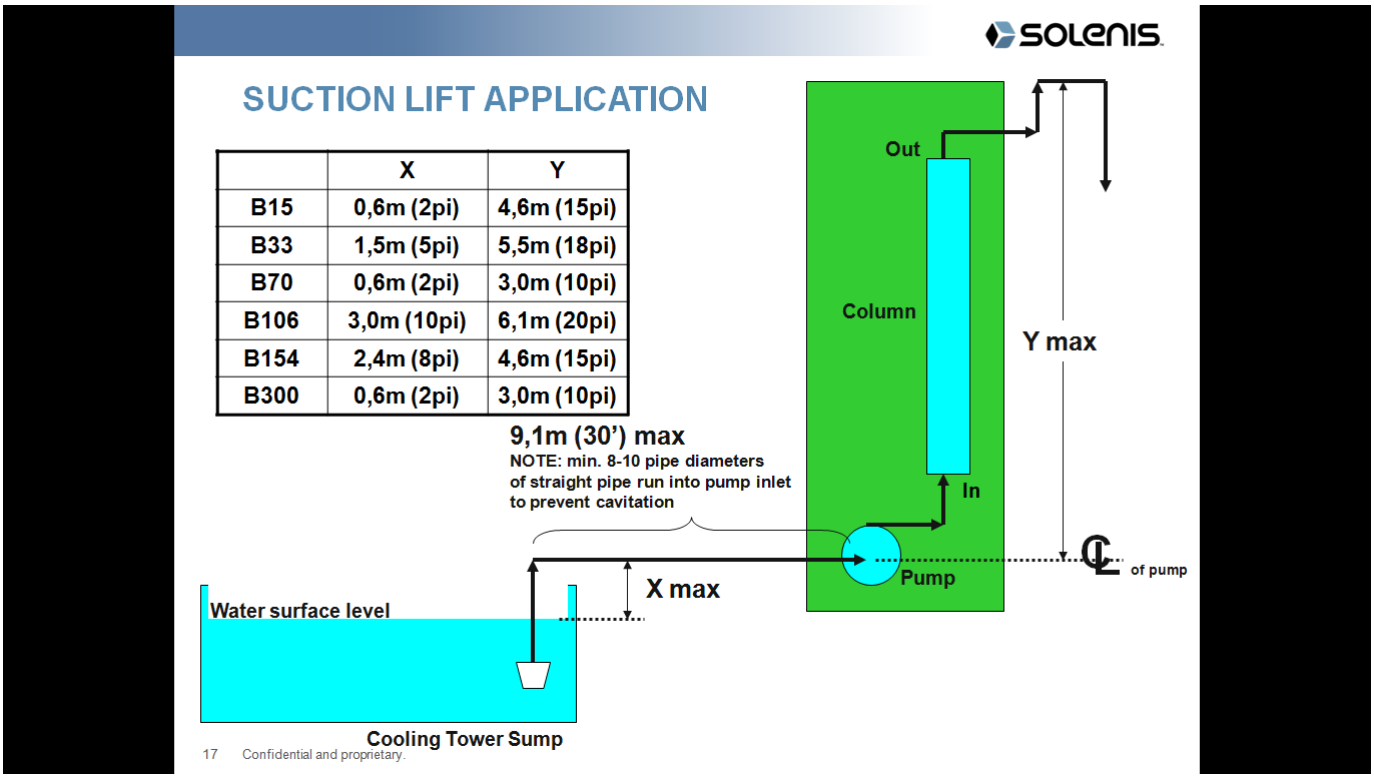
For multiple cell towers or multiple basin systems, discharge piping should be split to each basin if possible. Avoid hydraulic short-circuiting installations. Check with our Sonoxide Equipment Manager if this is not possible.

For the B15 model, the pump is to be mounted outside the Sonoxide cabinet as shown in the drawings provided with this unit. For outdoor installations, the pump will be provided with a TEFC (Totally Enclosed Fan Cooled) motor. The Sonoxide pump should not be installed outdoors without a TEFC motor unless the pump is sheltered.

The B15 pump inlet and outlet dimensions vary depending on pump type (flooded suction versus suction lift). The B15 Sonoxide system inlet/outlet will always be 2.5 cm / 3.8 cm (1" / 1.5") respectively.

In the rare occasion where the Sonoxide discharge line has a valve installed, these valves must be fully ported. Ported means that a 5 cm (2") size valve has 5 cm (2") orifice through the valve body to support the necessary flow.

Figure 2 – Suction Lift Installation



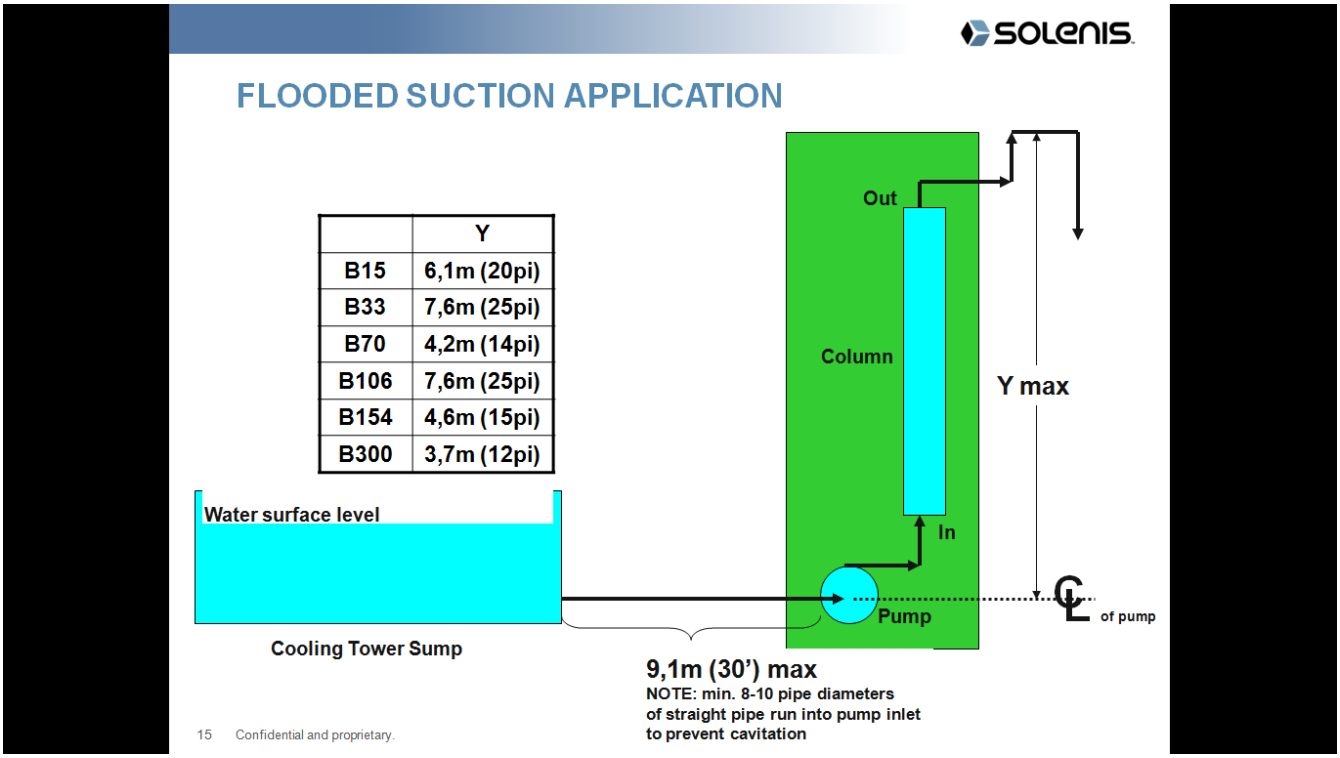
	X	Y
B15	0,6m (2pi)	4,6m (15pi)
B33	1,5m (5pi)	5,5m (18pi)
B70	0,6m (2pi)	3,0m (10pi)
B106	3,0m (10pi)	6,1m (20pi)
B154	2,4m (8pi)	4,6m (15pi)
B300	0,6m (2pi)	3,0m (10pi)

If X is not met – a decrease in flow and cavitation can occur.
If Y is not met – an increase in backpressure on column could decrease performance.

NOTE: Max of 9.1 m (30 ft.) of horizontal length allowed for suction line into pump. No more than (4) 90° elbows in suction line (45° elbows are preferred). To prevent cavitation, a straight run of pipe equal to a minimum of 8 - 10 pipe diameters in length are highly recommended. For example, if pipe diameter is 5 cm (2"), then a minimum of 41 cm – 51 cm (16" - 20") of straight run <u>WITHOUT</u> restrictions are necessary into suction side of pump.

Install a water fill port on the supply line to help prime pump.

Figure 3 – Flooded Suction Installation



If Y is not met – an increase in backpressure on column could decrease performance.

NOTE: Max of 9.1 m (30 ft.) of horizontal length allowed for suction line into pump. No more than (4) 90° elbows in suction line (45° elbows are preferred). To prevent cavitation, a straight run of pipe equal to a minimum of 8 - 10 pipe diameters in length are highly recommended. For example, if pipe diameter is 5 cm (2"), then a minimum of 41 cm – 51 cm (16"- 20") of straight run <u>WITHOUT</u> restrictions are necessary into suction side of pump.

Table 1 – Inlet / Outlet Plumbing Pipe Sizing Required & Pump Suction/Discharge Limitations

			Suction Limitations	Discharge Limitations
Sonoxide Model SL = suction lift FS=Flooded Suction	Inlet Pipe Size (FNPT)	Outlet Pipe Size (MNPT)	Max Height from Centerline of Pump to Water surface	Max Height from Centerline of Pump to Highest Sonoxide Discharge pipe
B-15 FS	Pump not in cabinet. 3.17 cm (1.25") into pump suction and 2.5 cm (1") from pump discharge to Sonoxide cabinet	3.8 cm (1.5")	n/a	6.1 m(20ft)
B-15 SL		3.8 cm (1.5")	61 cm (2ft)	4.6 m(15ft)
B-33 FS	3.17 cm (1.25")	3.8 cm (1.5")	n/a	7.6 m(25ft)
B-33 SL	3.8 cm (1.5")	3.8 cm (1.5")	1.52 m (5ft)	5.5 m(18ft)
B-70 FS	5 cm (2")	6.3 cm (2.5")	n/a	4.2 m (14ft)
B-70 SL	5 cm (2")	6.3 cm (2.5")	61 cm (2ft)	3 m (10ft)
B-106 FS	5 cm (2")	6.3 cm (2.5")	n/a	7.6 m(25ft)
B-106 SL	7.6 cm (3")	6.3 cm (2.5")	3 m (10ft)	6.1 m(20ft)
B-154 FS	6.3 cm (2.5")	7.6 cm (3")	n/a	4.6 m(15ft)
B-154 SL	7.6 cm (3")	7.6 cm (3")	2.4 m (8ft)	4.6 m(15ft)
B-300 FS	Goulds 10 cm (4") Flange pipe	10 cm (4") Pipe	n/a	3.7 m (12ft)
B-300 SL	Goulds 10 cm (4") Flange pipe	10 cm (4") Pipe	61 cm (2ft)	3 m (10ft)

***** NOTE: Max of 9.1 m (30 feet) of horizontal length allowed for suction line into pump. No more than (4) 90^{o} elbows in suction line (45^{o} elbows are preferred). To prevent cavitation, a straight run of pipe equal to a minimum of 8 - 10 pipe diameters in length are highly recommended. For example, if pipe diameter is 5 cm (2"), then a minimum of 41cm - 51cm (16" - 20") of straight run <u>WITHOUT</u> restrictions are necessary into suction side of pump***.

For areas with freeze concern, heat tracing and insulation of the inlet and outlet piping should be considered. Freezing is only a concern if the unit shuts down. Frozen pipe will prevent treatment and could cause damage to the unit. Sonoxide cabinet heaters, if equipped, will not protect piping outside the cabinet and will not protect the Sonoxide unit in the event of power loss.

For installations in freeze areas, discharge piping should be sloped to free drain if at all possible.

Electrical, Water and Air Flow

Power should be run to the unit as required and shown on the supplied drawings. Standard unit voltage is as follows:

Table 2 – Electrical, Water, and Air Flow Specifications

SONOXIDE UNIT	POWER REQUIREMENTS	WATER FLOW (gpm)	AIR FLOW (m^3 / hr) and (ft^3 / hr.)
B-15 FS	120V 1pH 60Hz (20 amp)	15	0.42 to 0.62 m^3/hr (15 to 22 ft^3/hr)
B-15 SL	120V 1pH 60Hz(20 amp)	15	0.42 to 0.62 m^3/hr (15 to 22 ft^3/hr)
B-33 FS	240V 1pH 60Hz(15 amp)	33	0.85 to 1.36 m^3/hr (30 to 48 ft^3/hr)
B-33 SL	240V 1pH 60Hz(15 amp)	33	0.85 to 1.36 m^3/hr (30 to 48 ft^3/hr)
B-70 FS	480V 3pH 60Hz(15 amp)	70	1.8 - 2.8 m^3/hr (65 – 100 ft^3/hr)
B-70 SL	480V 3pH 60Hz(15 amp)	70	1.8 - 2.8 m^3/hr (65 – 100 ft^3/hr)
B-106 FS	480V 3pH 60Hz(15 amp)	106	3 to 4.2 m^3/hr (105 to 150 ft^3/hr)
B-106 SL	480V 3pH 60Hz(15 amp)	106	3 to 4.2 m^3/hr (105 to 150 ft^3/hr)
B-154 FS	480V 3pH 60Hz(15 amp)	154	4.1 to 6.2 m^3/hr (145 to 220 ft^3/hr)
B-154 SL	480V 3pH 60Hz(15 amp)	154	4.1 to 6.2 m^3/hr (145 to 220 ft^3/hr)
B-300 FS	480V 3pH 60Hz(20 amp)	300	4.1 to 6.2 m^3/hr per column (145 to 220 ft^3/hr) per column
B-300 SL	480V 3pH 60Hz(20 amp)	300	4.1 to 6.2 m^3/hr per column (145 to 220 ft^3/hr) per column

Power requirement data is for pump and transformer only (lower than specified will result in insufficient transformer output to the emitters and may require boosting). Power requirement from transformer output to emitters is 40 volts +/- 5%. Confirm voltage/amperage requirement before connecting.

Voltage and amperage supplied to the unit must be as required. If supplied voltage is lower than required, poor operation and biological control results, overheating and possible damage may occur. If supplied voltage is 10 percent lower than listed above, please consult our Sonoxide Equipment Manager before starting the unit.

If lower voltage exists, we need to configure the unit for a buck booster transformer for proper functionality.

Section 2 - Heaters for Freeze Protection

For Sonoxide systems having the Heater Package option, a separate 120VAC line run to the small enclosure directly underneath the main electrical enclosure is required. Amperage requirements are defined on the connection drawing. Models B15 and B33 do not require a second 120VAC power source for the heater package.

Heaters are set at the factory at 7° C (45 ^{o} F). The adjustment knob is located on the bottom of the heater. The knob shows both Celsius and Fahrenheit settings. The setpoint is indicated by the raised metal dot next to the dial.

Heaters should be tested to verify operation upon start-up. See the Troubleshooting Guide (located in the back of this manual) if the heaters do not appear to function.

Technical Support

Please contact our Sonoxide Equipment Manager, Steve Petrillo at, 973-874-0162, cell 201-841-3106, or sjpetrillo@solenis.com.

Section 3 - Start-up Checklist

NOTE: Do not start the Sonoxide system if any valve is closed on the inlet or outlet piping that would restrict flow. Excessive backpressure may result in damage to the Sonoxide system and/or poor treatment results.

Confirm that the unit is supplied with proper voltage.

Confirm that any isolation valves on the water inlet are open allowing water to flow freely to the pump.

For suction lift pumps, the water tank on the pump head must be filled prior to system start-up. Some pump variations have a metal plug on the top of the pump that can be removed. For any pump heads that do not have a water fill plug, water can be added by disconnecting the piping at the first union above the pump. Reconnect this union before system start-up.

For flooded suction applications, water must be immediately available to the pump at the pump head. **Starting the unit dry can cause seal damage on the pump.**

Confirm that there are no valves closed on the water outlet line back to the system.

Confirm that all PVC unions inside the cabinet are tight. **Unions often loosen in shipment**. Hand tighten only, do not use a wrench. If leaks appear on the column, tighten further with a pipe wrench. Do not tighten any more than necessary. Over-tightening will make it difficult to remove the ultrasonic column for scheduled replacement at a later date

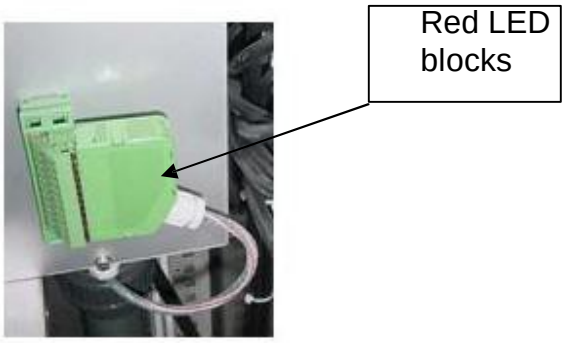
For 3-phase pump motors, confirm that pump rotation is facing the correct direction. Directional arrows on the pump or in the cabinet will indicate proper rotation direction.

Section 4 - System Start-up

For initial system start-up, open the main cabinet door. Check for leaks on start-up and confirm that the emitter LEDs are lit once running.

With door open, press the green START button on the side of the unit. The pump will come on right away. After 30 seconds of continuous established water flow, the green "Ultrasonics" light on the side of the cabinet will come on. Red LED lights come on inside the cabinet on the bottom of the emitter column and water containing entrained bubbles will be seen at the top of the column in the clear section of the discharge piping.

LEDs per model:
B15 – 1 Block of 6 LEDs
B33 – 1 Block of 12 LEDs
B70 – 2 Blocks with 24 total LEDs
B106 – 3 Blocks with 32 total LEDs (4 are unused and are marked)
B154 – 4 Blocks with 48 total LEDs
B300 – (2) Columns EACH with 4 Blocks and 48 LEDs per column



If continuous water flow is not established after 2 minutes, the unit will shut down and alarm.

Suction lift applications may take more than 1 minute to establish the required water flow to initiate the ultrasonics. In the event the unit shuts down before flow is established, restart the system. Suction lift-style pumps utilize a backflow protection valve. It may take 2 or more starts to allow the pump to fully fill the intake pipe.

System operating pressure – nominal operating pressure for all units should be 207kPa (30 psi). In the event that flow drops below the pressure switch set point of 103 kPa (15 psi), the unit will shut down indicating a no flow / low flow condition. These switches are easily replaced. Unthread and reconnect cable to existing harness. **ONLY DURING A SHUTDOWN AND SYSTEM DRAIN** should these switches be cleared of debris…if heavily fouled call S. Petrillo for a replacement. These are set typically for 103 kPa (15 psig) (outer ring with indicator lock).

Venturi Check Valve Assembly with Vacuum Valve & Gauge: this assembly is the main air inlet to the venturi or eductor that will create the aspiration for bubble formation in the ultrasonic column/chamber. It's important to note that the precision turndown valve (on the units shipped 8/09 and later) are equipped with a vacuum gauge that will give the end user a vacuum pressure reading in bar. Recommended operating range on the gauge is -0.4 bar to -0.75 bar. Increasing or decreasing of the turndown valve will bring the pressure of the incoming air into range.

The Sonoxide systems presently in operation (pre 8/09) utilize a small PVC pre drilled plug that has been factory set for the size unit that you have. Removing this plug will create more turbulent bubble action thus possibly affecting downstream results. Refer to section 9 for Maintenance.

Existing Models with No vacuum valve and gauge (uses a PVC plug for air inlet amount)

Sonoxides shipped after 8/09 with be equipped with this vacuum valve and gauge assembly

Section 5 - System Operation

During operation it should be noted if any LEDs fail to light. It is not a concern if LEDs go out over time as long as good results are continued. It should be reported to our Sonoxide Equipment Manager if more than 30 percent of the LEDs are out or if system performance is reduced.

Do not close valves on the outlet piping for the system. This could cause leaking of the column and potential damage due to excessive backpressure.

Do not try to start the system without available water.
Upon pressing the system START button, the pump will immediately come on.
After 30 seconds of continuous flow past the pressure switch, the ultrasonics will turn on.
If continuous flow is not established after 2 minutes, the unit will shut down and alarm.
When running, if flow is lost for more than approx 5 seconds, the ultrasonics will turn off.
If flow is reestablished within 1 minute, the ultrasonics will turn back on.
If flow is not reestablished after 1 minute, the unit will alarm and shut down.

Section 6 - System Alarm

The Sonoxide system has one main alarm. In the event of a loss of water flow to the treatment chamber, this alarm will activate and shut the system down. This alarm will be active at any time when the unit is off. (See Troubleshooting Guide.)

A flashing flow alarm light will illuminate when the Sonoxide system has reached one year of service for the USA built units. To disable, stop the unit. Press and hold the STOP button, and concurrently press the START button. Contact our Sonoxide Equipment Manager to determine if the ultrasonic column needs to be replaced.

Section 7 - System Shutdown

Always shut down the Sonoxide system before any system drain down.

Never block incoming supply water piping or discharge piping before shutting down Sonoxide system.

To shut down, press the STOP button on the side of the cabinet. The ultrasonics will go off first followed by the pump approximately 30 seconds later.

For seasonal operation/storage, the entire Sonoxide system and connected piping must be drained. A drain plug is located just below the ultrasonic treatment chamber. Additionally, the pump should be drained to prevent any possible freezing inside the pump. Some pumps have bottom drain plugs. If no drain plug is present, all water should be forced out with a compressed air hose or the pump should be disconnected and physically drained. Along with draining the pump, consideration should be given to adding anti-freeze. When anti-freeze is used, it must be drained and flushed out of the pump casing prior to refilling and re-start of the Sonoxide unit because this anti-freeze is a nutrient source for Micro Biological activity.

Section 8 - Maintenance

Confirm operating basics - voltage, water flow, and vacuum pressure through venturi:

- Water pressure at the discharge side of the pump should be 207 kPa (30 psi) minimum (not >40)
- Voltage – 40V +/- 5% (if hard wired, check Transformer Output to transducer, if plugged into outlet, check outlet)
- Water flow – match Sonoxide pump (i.e., B33 = 125 lpm (33 gpm); B300 = 1 135 lpm (300 gpm) / requires ultrasonic flow meter)
- Vacuum pressure – - 0.4 to - 0.75 bar (minus 0.4 to minus 0.75 bar)

Sonoxide Ultrasonic columns (a.k.a. ultrasonic cells) through field use and lab testing have been found to remain effective for 12 months or approximately 8,800 hours of continuous run time.

It is **mandatory** that columns must be changed out each year on a prescribed anniversary date.

There are two methods in place to alert the Sonoxide user of an upcoming column changeout. The first is a provision built into the Sonoxide control panel for an automatic reminder at the 12 month mark. The general alarm light will begin to flash and the unit will continue to run as normal. In addition to this visual alarm flashing, the programmable logic controller (PLC) within the control panel will register LED output #2 as a flow alarm/maintenance alarm. Once the column has been changed out, there is a simple reset procedure to cancel the reminder alarm. In addition to the visual alarming capability, the Sonoxide Equipment Manager will also generate a reminder email 30 days prior to the 12 month mark requesting a ship to and contact name for the shipment of the replacement column.

The replacement column is shipped with instructions and if necessary, a strap wrench to remove the top and bottom unions. Columns are shipped from and returned to our Sonoxide equipment location:

CONTROL & POWER SYSTEMS - 17 Spielman Road, Fairfield, NJ 07004

The return of the used column is shipped in the very durable box that the new column came in…in addition there is a form indicating the information on the column and the instruction sheet for physically changing the column.

Each column is tracked and tagged with a four digit serial #. This tracking allows for easy reporting of column that are due for replacement as well as cost accounting purposes.

A replacement column consists of ALL new emitters or piezos, any circuit boards that were deemed needing replacement during bench testing, column cleaup, rewiring and any other parts that are required to bring the column back up to 100% spec. In addition, the refurbished column is air and water tested under pressure prior to shipment.

The ultrasonic treatment chamber is easily removed and replaced with a new chamber. **This task is performed by the Solenis Representative and/or field technician. See pages 20 to 24 for the detailed procedure.**

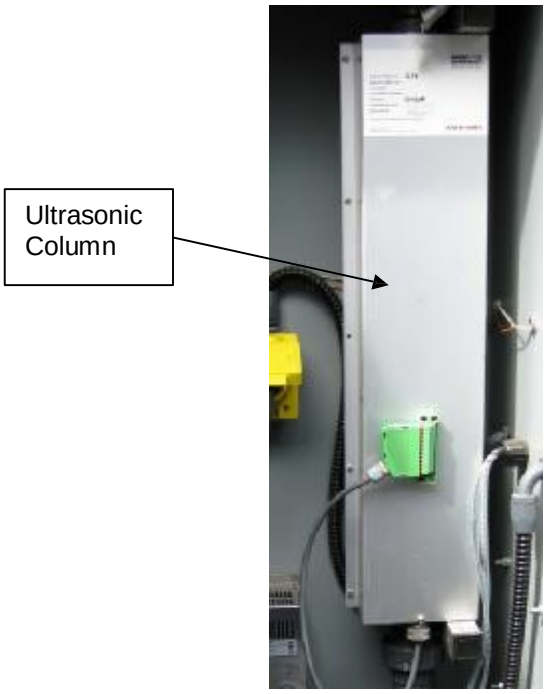
Logistics of all column replacement(s) are made through the Sonoxide Equipment Manager – Steve Petrillo 973-874-0162, 201-841-3106, or sjpetrillo@solenis.com

Sonoxide ULTRASONIC COLUMN CHANGEOUT PROCEDURE

Please contact Steve Petrillo office (973) 263-7882 or (973) 874-0162 or cell (201) 841-3106 with any questions regarding column replacement.

Before Replacement:

Review the work described below with the customer to ensure compliance with all customer safety and Lockout / Tagout practices.
The Sonoxide system pump motor may be hot. Wear protective sleeves and allow the pump motor to cool prior to replacing the column.
Inspect the replacement column for any damage. At the same time pick up the column and confirm your ability to handle it before removing the existing column. For larger columns (B106 and above), some assistance may be required to safely effect the changeout.
Allow sufficient time for the changeout. If no difficulties are encountered, it should be possible to replace a column in < 30min. However, it is advisable to allow 1 hour per column replacement to account for any unforeseen difficulties.



Replacement :

1. Before removing the existing column, compare it to the new column to ensure the replacement column is the proper type and the union connections match. Standard columns have the female half of the union on top of the column and male half on the bottom.

2. With the Sonoxide system turned off, disconnect the ultrasonic column power cord.
   Model B15 uses a black quick connect (see Figure 1).

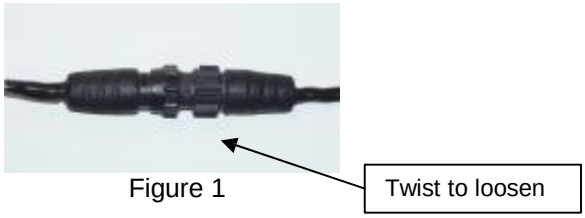


Figure 1

Models B33 and higher use a quick disconnect receptacle (see Figure 2).

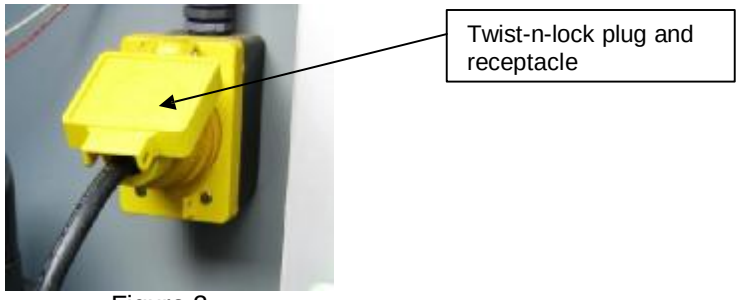


Figure 2

Some of the newer units have a hard wired terminal box which will require some plant electrician assistance to complete. (See Figure 3)

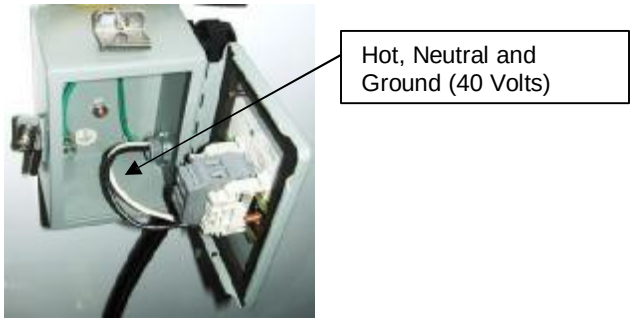
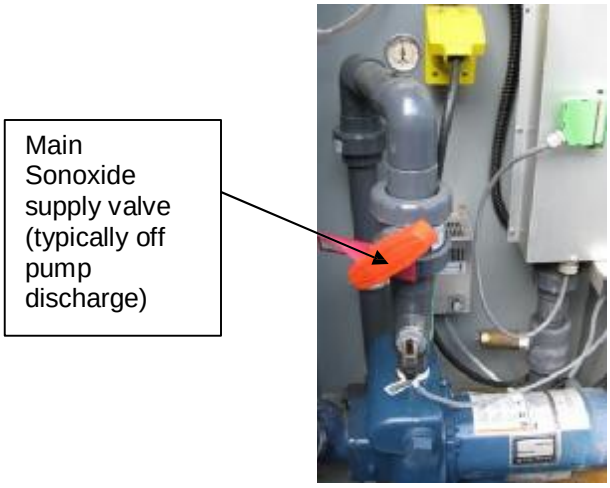


Figure 3

The columns supplied to you will have the appropriate end connection based on the unit serial # given when the column was requested.

3. Close inlet and outlet valves on the supply and discharge piping, if present, to prevent water flow through the column. This is particularly important for systems with flooded suction pumps, or where siphoning may occur.



4. Carefully remove the green LED light harness from the indicator rack. (See figure 3)

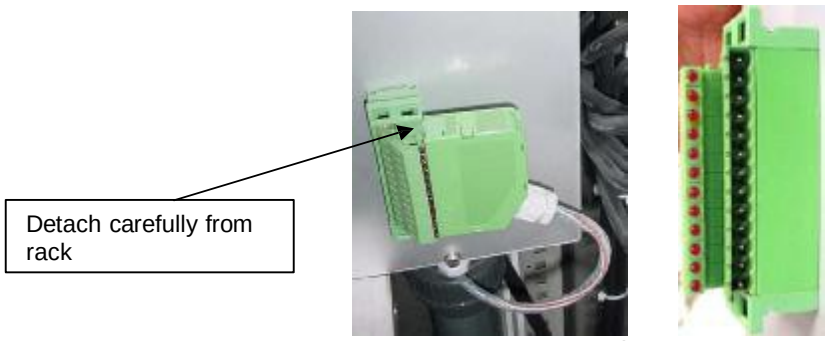


Figure 3

5. Drain water from the column and discharge piping. Note, if no drain is present, water may be removed through the venturi check valve. To do this, remove the brass check valve leading to the venturi (see Figure 4). This will allow water to drain out.

Figure 4

6. Loosen the column unions with the strap wrench (See Figure 5) provided with the replacement column. Direction for loosening the unions is to spin the unions from right to left (when facing the column) for standard configurations. Any remaining water from the column will discharge after the unions are loosened. *For that reason it is best to start with the bottom union.*

Figure 5

Top column union

Bottom union

7. Loosen the upper and lower mounting hardware ("D" clips) that secures the column (see Figure 6). Do not loosen bolts on the back of the cabinet. Locking pins are provided with your replacement column. The top and bottom mounting channel easily posts slide over the permanent studs to the cabinet back plate, then secure with top and bottom "D" locking clips. (See Figure 6)

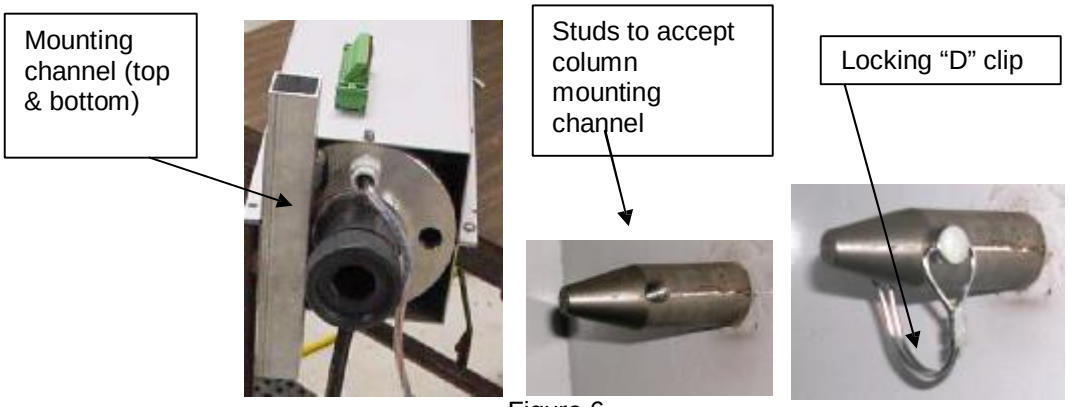


Figure 6

8. While the column is removed, clean the sight glass (bubble window) if deposits have accumulated. (See Figure 7)

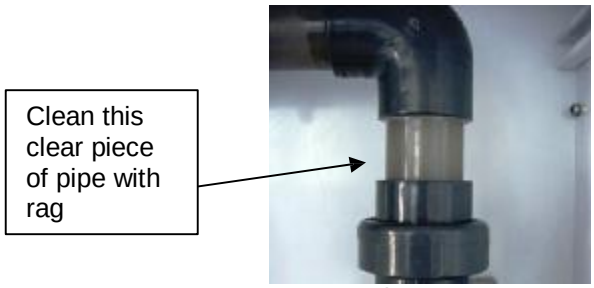


Figure 7

9. Install the replacement column by reversing the above listed directions.

10. Once installed, mark the installation date on the label on the outside of the ultrasound column. This label will serve as a reference for confirming the date of the next scheduled annual replacement. (See Figure 8)

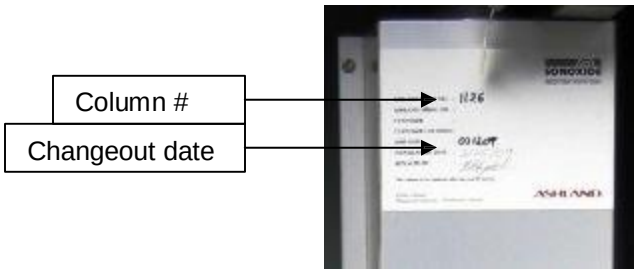


Figure 8

11. Resetting the Alarm Timer. After one year of runtime the alarm light on a Sonoxide system will flash, indicating it is time to replace the ultrasound column (this does not include the B15). To reset, simply turn off the system. With the system off, press and hold the “OFF” button. While depressing the “OFF” button, press and hold the “START” button. Depress both buttons for 10 seconds. The timer must be reset when you replace the column in order for the reminder alarm to be accurate.

12. Prior to restarting the system, ensure the following:
    - Unions are tight, and no leaks are present.
    - Mounting hardware is secured.
    - All valves are in the correct position.
    - The column is plugged in.

Return of Used Columns:

The used ultrasound column and strap wrench as well as the column paper form should be packed into the replacement column shipping box and returned as soon as possible. Contact Traffic Services for normal shipping logistics. The column will be refurbished and used for other annual Sonoxide ultrasound column replacement.

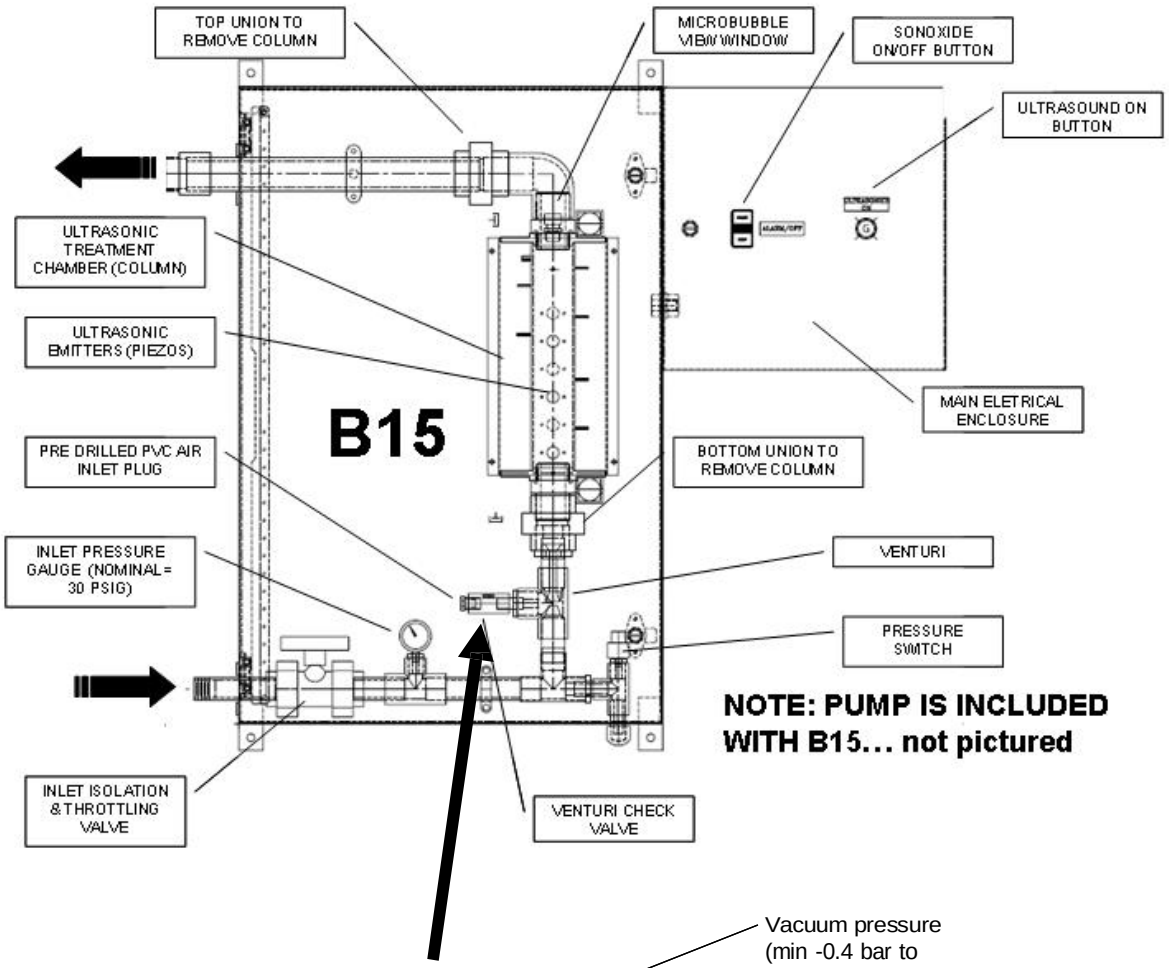
ALL COLUMNS ARE TO BE RETURNED TO:

Control & Power Systems
17 Spielman Road
Fairfield, NJ 07004
Attn: Mr. Larry Mesmer

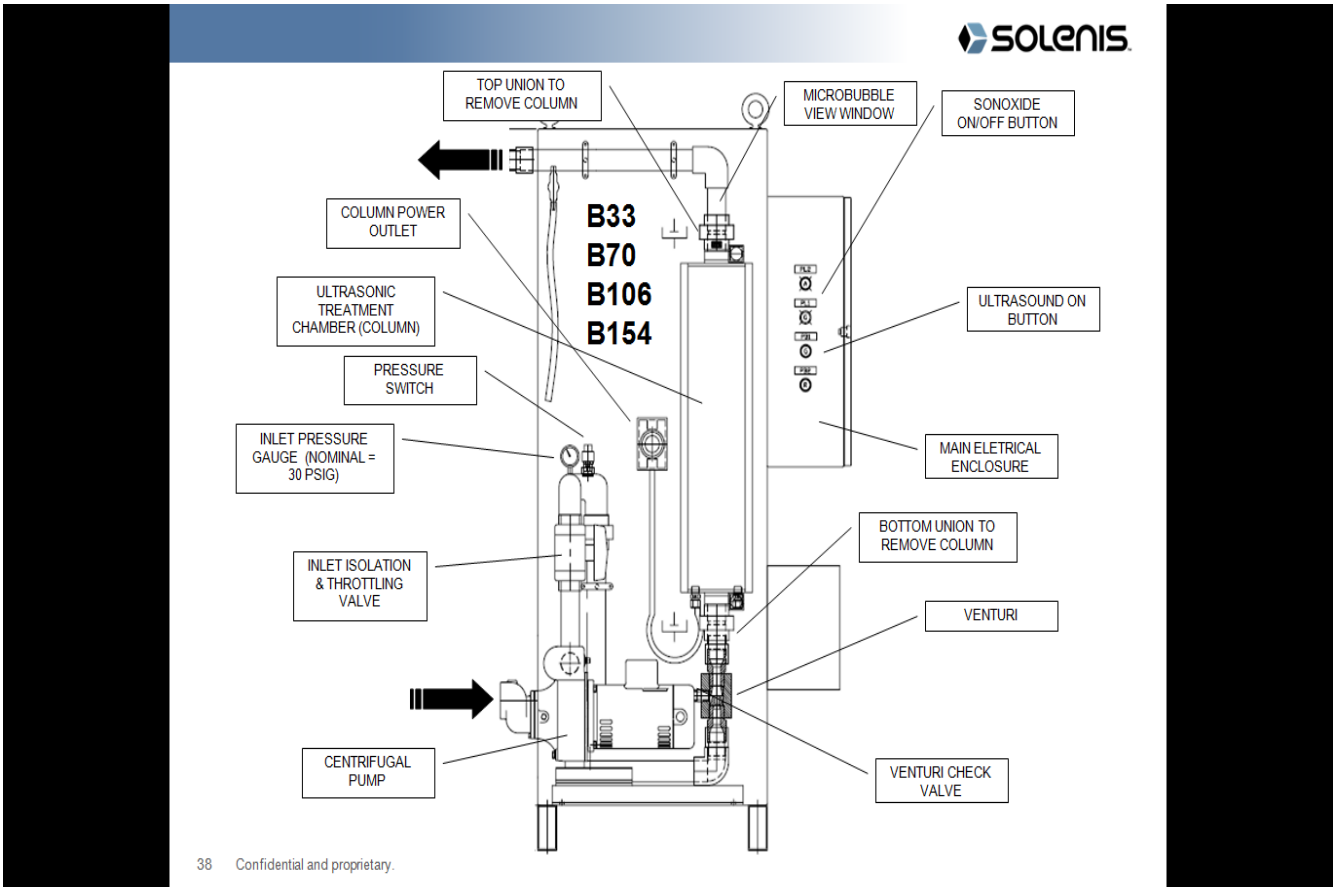
VENTURI CHECK VALVE MAINTENANCE: Periodic cleaning of the check venturi check valve is recommended to free the check and spring of any debris, silt, dirt or solids that may have collected over time. This cleaning will prevent the check from failing in the open position thus causing leak during shutdowns. The cleaning is easily performed and can be completed during normal Sonoxide run operations. Simply unthread the check valve, remove the PVC plug and clean the inside with water and a small brush. Re-insert the check valve into the body of the venturi by threading it back in.

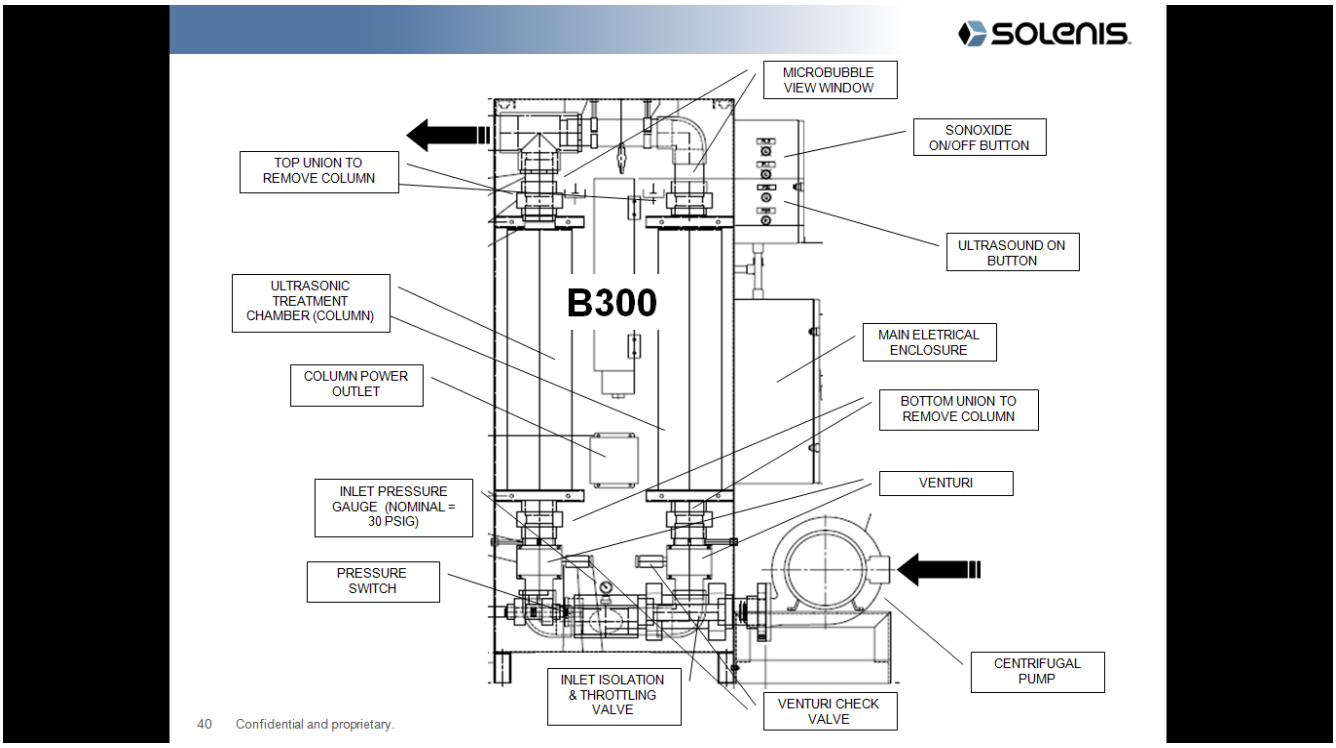
Periodically it is recommend that this check valve be cleaned DURING SYSTEM SHUTDOWN AND DRAIN to clear the check valve spring and seat of any debris.

Section 9 - Sonoxide Components



For Sonoxides shipped after 8/09 this assembly will be included


SOLENIS
TOP UNION TO REMOVE COLUMN
MICROBUBBLE VIEW WINDOW
SONOXIDE ON/OFF BUTTON
COLUMN POWER OUTLET
B33
B70
B106
B154
ULTRASONIC TREATMENT CHAMBER (COLUMN)
ULTRASOUND ON BUTTON
PRESSURE SWITCH
INLET PRESSURE GAUGE (NOMINAL = 30 PSIG)
MAIN ELETRICAL ENCLOSURE
BOTTOM UNION TO REMOVE COLUMN
INLET ISOLATION & THROTTLING VALVE
VENTURI
CENTRIFUGAL PUMP
VENTURI CHECK VALVE
38 Confidential and proprietary.


SOLENIS
MICROBUBBLE VIEW WINDOW
SONOXIDE ON/OFF BUTTON
TOP UNION TO REMOVE COLUMN
ULTRASOUND ON BUTTON
B300
ULTRASONIC TREATMENT CHAMBER (COLUMN)
MAIN ELETRICAL ENCLOSURE
COLUMN POWER OUTLET
BOTTOM UNION TO REMOVE COLUMN
VENTURI
INLET PRESSURE GAUGE (NOMINAL = 30 PSIG)
PRESSURE SWITCH
CENTRIFUGAL PUMP
INLET ISOLATION & THROTTLING VALVE
VENTURI CHECK VALVE
40 Confidential and proprietary.

Section 10 - Model # / Serial

All Sonoxide systems have a serial number located on the inside of the main cabinet door. This serial number identifies critical operational specifications for your customized Sonoxide system.

SB-106-0903-1003-9

SB – Indicates units without Lakos separator.
106 – Indicates GPM flow through the unit
0903 – Indicates date of construction (September 2003) 1003 – Indicates approximate date of installation (October 2003)
9 – Indicates unit lot number

Section 11 - Troubleshooting Guide

Mechanical Performance Issues

Mechanical issues should be addressed first if any problems with Sonoxide performance occur (including biological issues). This section should be first reviewed, followed by inspection and visual observation of the Sonoxide unit. It may require that a "Sonoxide Field Test Kit" be made available for use on-site. Tables 1 (page 10) and 2 (page 11) of this manual provides mechanical and electrical specifications to aid in the assessment of the mechanical performance issues.

Table 3 - Mechanical Performance Issues

Problem	Possible Cause	Solution
Pump won't run	Motor over load trips or chatters.	Reset overload, check supply voltage for fluctuations, and verify amperage electrical service with those provided in table 2 (page 11).
	Breaker tripped	Check/reset breakers
	Improper voltage	Check motor wiring for correct voltage provided in Table 2, page 11.
Unit runs but shuts down after several seconds or longer (less than one minute)	Flow or Pressure switch problem on discharge side of pump.	Check Flow or Pressure switch. Ensure pressure switch is set at 15 psig. Contact Steve Petrillo 973-872-0164, cell 201-841-3106, or sjpetrillo@solenis.com
	Water supply interruption, loss of prime	Confirm Suction and Discharge Limitations in Table 1, page 10 and Figures 2 and / or 3 (pages 8 or 9).
		Check for air leaks on inlet line, Pressure Gauge Ramping or Fluctuating on discharge side of pump.
		Check basket strainer and or foot valve screen on pump inlet for blockage
		Check proper functioning of pump inlet check valve. If not equipped with a check valve then one may be required.
	Pump Rotation Incorrect	Verify Pump Rotation; For 3-phase pump motors, confirm that pump rotation is facing the correct direction. Directional arrows on the pump or in the cabinet will indicate proper rotation direction. Contact Solenis Technical Support Personnel

Problem	Possible Cause	Solution
Reduced flow Pressure gauge reads lower than normal (30 + / - 3 psig) Pressure Gauge Ramping or Fluctuating (Pump Cavitation)	Clogged pump head / impeller Mechanical Seal Failure Worn Wear Ring	Disassemble pump head, clear debris Check Seal and Wear Ring Sealing
Reduced flow Pressure gauge reads lower than normal (30 + / - 3 psig) Pressure Gauge Ramping or Fluctuating (Pump Cavitation) Bubble pattern slower or has larger bubbles	Inlet filter clogged	Remove basket, clear debris
	Valves not open	Verify supply and discharge valves are open
	Venturi or check valve clogged	Disassemble and check / clean debris
	Reduced or lost flow	Verify water supply
Bubble pattern slower or has larger bubbles Unit occasionally trips off	Hole in PVC plug of venturi check valve assembly	Clean air hole
	Venturi or check valve clogged	Disassemble, check for debris
	Pump Cavitation Seal Failure Low Air Vacuum	See Preceding Reduced Flow and Pressure Discussion. Confirm that height of lift to pump center line is as found in Table 1, page 10 and Figures 2 and 3 on pages 8 and 9.
	Loss of pump prime	Confirm lift to pump center line is as specified in Table 1 (page 10) and the supply foot/check valve assembly to the pump is operating correctly. Introduce water into pump volute through pump casing inlet (if applicable). If pump casing inlet is not available attempt to introduce water into suction line prior to pump. Attempt to restart pump and allow several minutes for priming. If still unsuccessful contact your Sonoxide equipment manager - Steve Petrillo
	Excessive Backpressure on Ultrasonic Chamber Discharge	Ensure Discharge Line not valved off or obstructed with debris. Ensure Return Discharge to system is atmospheric.
	Loss of water supply	Verify water supply

Problem	Possible Cause	Solution
Unit occasionally trips off Red LEDs not lit, but the pump operates normally	Circuit breaker trips	Check / reset circuit breaker
	Flow (pressure) switch problem	Check/adjust flow (pressure) switch Replace flow switch / pressure switch. Contact Sonoxide equipment manager for emergency repair.
	Loss of pump prime	Confirm adequate supply basin height/operation
	Loss of pump prime Loose LED block	Check for air leaks on inlet line or vortexing at inlet line connection to an existing supply line (installation of a large enough basket strainer should hold sufficient reserve water to dampen the vortexing effect.
		Check green LED block connector
Red LEDs not lit, but the pump operates normally	Column receptacle unplugged	Plug in column power connector
	Circuit breaker tripped	Check/reset circuit breakers
Green ultrasound indicator not lit but LEDs are on	Indicator bulb burned out	Remove green lens and replace bulb
Heater will not come on	Circuit breaker tripped Customer supply voltage not on Heater setting below current temperature	Check Sonoxide heater circuit breaker box on the outside of the unit; 6" x 6" box marked 120 VAC Verify customer supply voltage is on Adjust temperature knob
Flashing flow alarm light	One year of emitter column service has occurred	Arrange for column replacement by contacting our Sonoxide Equipment Manager

Technical Support

To assist with troubleshooting a Sonoxide® field test kit is available. This kit will allow for the following checks:

1. Water flow – as per table 2 on page 11.
2. Air flow to venturi as per table 2 on page 11.
3. Voltage at the secondary side of the transformer should be 40 VAC +/- 5 %.
4. Water pressure at the discharge side of the pump should be 30 psi minimum (not > 40)

For additional technical support please contact our Sonoxide Equipment Manager, Steve Petrillo at 973-874-0162, cell 201-841-3106, or sjpetrillo@solenis.com

Biological Performance Issues

The control of biological activity within recirculatory water systems is typically judged effective based upon low aerobic bacterial counts (i.e. $\leq 10^4$ CFU/ml~~t~~) and the absence of anaerobic bacteria, such as sulfate reducers in the bulk waters. During the initial start-up of Sonoxide treatment of cooling systems waters, the aerobic plate counts (TBC) may begin to increase within the first 2 weeks and eventually equilibrate around the third to sixth week depending upon the extent of foulants present. However, where systems are highly fouled with bioagglomerants, their release may result in post settlement fouling. In order to avoid lengthy delays or degrees of perceived "apparent uncertainty" in performance, a pretreatment cleaning of systems should be exercised prior to utilising Sonoxide technology for biological control. After all mechanical performance issues and system factors associated with the system under going treatment have been investigated, the troubleshooting of biological performance issues can then be investigated utilizing the technical application bulletin - **Sonoxide Biological Performance Troubleshooting Supplement** in order to improve the 'out of specification' results compared to the targeted control ranges. The mechanical and electrical issues associated with Sonoxide operation for biological control are summarized in table 4 and detailed corrective actions are further outlined in the preceding Table 3. System factors are itemized in Table 5.

Table 4. Trouble Shooting Guide - Sonoxide Operational Factors

Sonoxide Item	Possible Problem(s)	Corrective Action(s)
Electrical	1. High count of unlit LED indicators.	Replace chamber.
	2. Insufficient or inconsistent voltage.	Confirm voltage input to Sonoxide.
Mechanical	3. Insufficient system water flow through Sonoxide unit.	Confirm water flow through Sonoxide unit.
	4. Sonoxide chamber/emitters are fouled.	Replace chamber.
	5. Excessive airflow through the Sonoxide unit.	Confirm air flow into Sonoxide unit.
	6. Pump Cavitation	Confirm suction lift or flooded suction X & Y values on Figures 2 & 3 on pages 8 & 9. This data is also in Table 1, page 10.

Table 5. Trouble Shooting Guide – System Factors

System Item	Possible Problem(s)	Corrective Action(s)
Makeup Water	1. Deterioration in Makeup Water Quality (Higher NTU, TSS, COD, higher NH_3, PO_4 and other potential nutrients).	Confirm pretreatment clarifier/filtration performance. Investigate for source of makeup water contamination. Remove source of contamination or supplement with microbiocide. For waters disinfected by chloramine, confirm ammonia feed is only to stoichiometry for monochloramine species.
Bulk Water	2. Deterioration in Bulk Water Quality (Higher NTU, TSS, COD, higher NH_3, PO_4 and other potential nutrients).	Confirm makeup water quality. Investigate for system water contamination (e.g. airborne contaminants, process leaks). Remove source of contamination or supplement with biocide. For heat exchanger leaks, identify and repair, then precondition and sterilize. - During ongoing in leakage until repair, slug feed every apparent retention time biodispersant and alternating non-oxidizing microbiocide. For contamination from uptake of airborne debris: - Install mesh screening on air intake areas. - Elevate and redirect building exhausts away from cooling tower. - Pave or place aggregate material or decorative fence around cooling tower. Adjust bleed-off/blowdown rates. Prolonged periods of elevated micro-biological counts warrant consideration of a preconditioning or cleaning of biofilm (Coupon biological loading > 10^5 CFU/cm^2).

System Components/ Operation	3. System operation parameters shifted.(e.g. Higher heat loads, higher water operating temperature)	Adjust bleed-off/blowdown rates. Supplement with microbiocide(s).
	4. Cycling and/or change over of equipment into service.	Fit equipment idled for periods greater than 1 day with slip stream by pass to provide stagnant water volume displacement once every hour to 3 hours. Valve off and chemically store idle, redundant or seasonal equipment. Drain and flush dry not in use cooling towers and sumps.
	5. Stagnant/idle system segments or segments with low or intermittent flow.	Isolate and drain stagnant/idle segments. Flush before connecting back to system. Flush low flow sedentary segments prior to startup. Consider sterilization (5 ppm FAH for 6 hours). Balance water supply distribution and flow.
	6. High mud/sludge load in tower sumps, low points, equalization and cross over lines.	Under full flow with all recirculation pumps running, cross over lines open, flush out strainers, dead legs, and low points. Then stop, drain and hose out tower and sumps from top to bottom. Consider filtration. Precondition and sterilize if excessive biofilm is evident.
	7. Short-circuiting of the circulation of the system water.	Balance water supply distribution. Ensure proper recirculation flow.
	8. Short-circuiting of the circulation of the Sonoxide treated water.	Relocate Sonoxide supply or discharge to promote balanced distribution of Sonoxide treated water.

Section 12 – Test Kits/Procedures to Assess Microbial Counts in the Field

1) Suspended aerobic microbes (water)

Biological/Fungal Counts: (Target ≤10^3 CFU/ml)

- Dipslides: Microbiological Dual Assay Slides – 10/pk – SAP Code 100553
- Ordered from Hach via SAP
- See product data sheet for procedure details.
- Most used procedure due to cost and ease of use.

Plate Counts: (Target ≤10^3 CFU/ml)

- Petrifilm: 3M™ Petrifilm Plates Aerobic – 100/pk – SAP Code 99935
- See product 3M™ data sheet for procedure details.
- Usually not used due to the complexity of performing actual plate counts in the field. Also requires the purchase and use of dilution tubes and pipettes.

ATP (Relative Light Units – RLU)

- All ATP equipment and reagents are ordered directly from 3M™ via SAP.
- Uni-Lite NG ATP Meter – SAP Code 83890
- 3M™ Clean-Trace™ Hygiene Monitoring Tests
    a) AQF 100: 3M Clean-Trace Water – Free ATP – SAP Code 67309 – 100/pk
    b) AQT 100: 3M Clean-Trace Water – Total ATP- SAP Code 66998 – 100/pk
- Procedure (See 3M™ Product Data Sheet for Details)
- Guidelines for acceptable values will vary with the background ATP present in the system. It is virtually impossible to compare RLU factors to CFU/mL. However, a Total ATP RLU of for a system within control limits should be <500 RLU. Free ATP will vary with the cycling of water through the Sonoxide system, which is also dependent on system water loss and quality of make-up.

BART Tests: Slime Bacteria and Iron Bacteria

- All BART tests are ordered directly from Hach via SAP
- SLYM-BART – Slime Bacteria – SAP Code 66984 / 9 pack
- IRB-BART – Iron Bacteria – SAP Code 83875 / 9 pack
- See product data sheet for procedures and interpretation of results.
- BART tests in conjunction with microscopic analysis (IRB) and bacterial identification (SLYM) have been conducted in the lab.

2) Suspended anaerobic microbes (water)

Sulfate-reducing bacteria (SRB) – SRB-BART tests are offered to the field for the detection of SRB.

- SAP Code 84367 – ordered directly from Hach via SAP
- See product data sheet for procedure and interpretation of results.

3) Surface attached microbes (biofilm microbes):

Coupons (stainless steel or carbon steel) are used to monitor surface attached microbes. Use same type coupons in a system (do not mix stainless steel and carbon steel). Coupons are obtained by sales through the Water and Deposit group. Standard coupon area is 20.7 square centimeters (1.27 cm w X 7.6 cm l X 0.16 cm d) (3.38 square inches (½" w X 3" l X 1/16" d)

a) Methods using coupons: (solid)

Plate Counts (Target average - $\leq 10^5$ CFU/cm^2)

- Coupon is placed in 99 mL sterile phosphate buffer and then vigorously agitated. Buffer may be plated using standard plate count methods, or dipslide may be submerged into buffer.
- ~~o~~ See product data sheet for procedure and interpretation of results.

ATP – 3M "Clean-Trace Surface ATP" kit, formerly Biotrace Hygiene Monitoring kit

- 3M Clean-Trace Surface ATP, 100/pk (UXL100) --- contact 3M for purchase.
- Swab coupon with 3M™ Clean-Trace™ Surface Monitoring Wand
- Procedure requires swabbing one surface of the coupon, which would then be read by the luminometer. See product data sheet for procedure and interpretation of results.

Protein monitoring (3M™ Clean Trace™ Surface Protein Plus, formerly Biotrace Pro-tect™)

- Procedure would require swabbing one surface of the coupon, placing the swabbing wand back into the reagent containing tube. The results are semi-quantitative with four possible colors. The faster the test turns purple the higher the level of contamination on a surface. See product data sheet for procedure and interpretation of results.

b) Decutec® Method (Method not performed in the US) (For questions on method, contact MB Service Rep.)

Method uses coupons that have a specified preparation scheme, when the coupons are removed following exposure, the coupons are preserved in glutaraldehyde, stained with ethidium bromide and observed using Scanning Electron Microscopy (SEM) with Energy Dispersive X-ray (EDX), Confocal Laser Scanning Microscopy (CLSM), or Epifluorescence Microscopy (EP). Live/Dead Epifluorescence (for bacteria) is also used to determine the viability of the biofilm on the surface of the coupon. Currently, the lab in Helsinki is the only one with the appropriate equipment/reagent set-up to process these coupons. This analysis is not presently available in the U.S.