

Elgressy Engineering Services Ltd

Electrolysis, Corrosion and Cathodic Protection Specialists



3-1-10

***Electrochemical System for Legionella Bacteria
Control in Hot Water Supply Systems and Cooling
Towers***

Installation, Operation & Maintenance Manual

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TABLE OF CONTENT

Subject		Page No
Safety	3
Technical specifications	3
Components of the LPB	4
Peripheral Systems	.....	5
Unpacking and positioning	.....	5
Installation	.....	6
Operation	.....	9
Troubleshooting	.....	13
Maintenance	.....	14

Safety

Congratulations, you have acquired excellent equipment for the control and removal of bacteria in water. We thank you for trusting us.

The Elgressy LPB unit is electrolysis equipment involving the chemical decomposition of salts by electrical current. The unit has been designed and manufactured for safe operation by the user. Care must be taken to ensure that personnel handling this unit will be professional. **These instructions must be read before** installing and operating the unit.

Any handling of the electrical system, the panel, electrical connection and other items connected to electricity must be by a registered authorized electrician.

For safe and long lasting operation, please observe all instructions contained in this manual.

Technical Specification

Tank

Design Pressure	6 bar (88psi)
Operating Pressure	Max 6 bar (88 psi). Never exceed the air pressure.
Material	Carbon steel, epoxy painted on external side

Tank internals & accessories

Electrodes	Proprietary and patented metallurgy.
Scraper	Stainless steel shaft and plastic scraper – patented. Operated by an air piston.
Piston	2" Air operated, made by Bakara Ltd. Piston is electrically isolated from the tank body (in large systems only).
Max. air pressure	6 bar (88 psi).
Min. operating pressure	2 bar (29.5 psi)

Electrical/Control system

Operation	110V; 60Hz for USA. 220v; 50Hz for Europe.
Control	24V AC.
Electrolysis Power	LPB - 50V DC max; 10,16 & 25amp.

Components of the LPB System

This paragraph should be read together with drawing No 1.

1. Reaction tank (serves as cathode).
2. Electrodes (anodes): for LPB-3-1-10, 1 electrode.
3. Pneumatic piston for scraper operation.
4. Wiper (disc) mounted inside the reaction tank.
5. Water inlet valve – air operated.
Valve size and specifications:
For LPB-3-1-10 1-1.5"

All valves connections are UN/ISO7/1 Rp. threaded to BSP. The air connection includes restriction valve to slow air flow into this valve to prevent water hammer.

6. Drain valve – Air operated.
Valve size and specifications:
LPB-3-1-10 2"

All valves connections are UN/ISO7/1 Rp. threaded to BSP.

7. Air intake for valves operation – quick joint 6mm, with restriction valve for the inlet valve only.
8. Automatic electrical panel with stabilized current.
 - 8.1 Power supply for 50V and up to 10 amps direct current.
 - 8.2 24 Hours Time clock to activate flushing of scale from the reaction tank.
 - 8.3 Timers for the operation of the water inlet valve, drain valve and the piston.
Timer IN – Flush timer controls inlet valve.
Timer D – Controls Drain valve
Timer P – Activates Piston operation during the flush cycle. Operative as long as Timer D is operative.
Note that in some of the units the panel includes only 2 timers, Timer IN and Timer D. In these systems the piston is controlled by timer D.
9. Water outlet from the reaction tank – 1" threaded end to BSP.
10. Air release/intake valve, ARI ¾".

11. Optional connectors to circulation pump control.

Peripheral systems

The LPB is part of a more complex system. This system includes:
Circulation pump – to pump water from the hot water tank to the LPB.
Piping System to connect all the equipment.

If in doubt, please contact the manufacturer or the service company.

Unpacking and positioning

Preparation of Installation Site

No special preparation is required for installing the LPB units. The LPB unit can be installed on a concrete floor or any other flat surface. It is recommended to elevate the LPB on small concrete blocks to lift the LPB unit from the floor.

It is highly recommended to locate the LPB unit away from the weather. If LPB cannot be located indoors, place unit under cover from rain. Protect from freezing temperatures.

Before installing the LPB, make sure the peripheral systems are all in place and it is fully understood how the LPB must be connected.

Unpacking and Positioning

The system is packed in a wooden box. All units are firmly secured inside the box for safe transport. The equipment is shipped in horizontal position. The piston is sent loose and secured within the wooden box. The electrodes are usually sent mounted on the LPB lid but can be sent loose on occasion. The scraper disc is mounted on its place in the tank and held by a stopper pin from falling into the tank. The cover is mounted on top of the tank closed with bolts. Please note the signs indicating the “top side” on the package.

- Remove the top cover of the wooden case.
- Place the legs of each unit securely on the floor. It may be more practical to first put the unit in the vertical position and only then remove the rest of the box parts.

Important: The wiper piston (see drawing No 1 part No. 3 - the upper thinner element) is especially packed for safe transport. It is made of aluminum and is delicate. **Special care should be taken when handling it.**

Please follow any specific instructions you may receive together with the package.

Installation:

- The LPB is shipped with the piston and sometimes the electrodes not mounted. These will have to be installed on site. A great deal of care must be taken when mounting these elements and fitting the lid. Note instructions for lid removal.
The wiper disc is attached to the lid in its final position, held by a temporary screw/pin to its place.
- Position the unit(s) in its (their) final place. There is no need to secure the base to the floor by bolts. It is highly recommended that the unit be lifted about 10 cm (4 inches) above the floor on small concrete blocks so the legs will not be damaged by possible dripping or water accumulation on the floor.
- Check if electrodes are supplied loose. If so, they must be mounted on the lid before the piston is mounted. Lift the lid and place the electrodes inside the tank. Put the lid back but support it about 15 cm above the LPB flange. Slide your hand and grab an electrode. Lift it to the lid so that the connecting screw will pop out of the lid. Tighten the electrode with the supplied counter screw. Make sure you have placed the electrodes gaskets (inside the lid and outside of it) correctly to prevent water leaking from the electrodes connection. Repeat this action for all the electrodes. Mount the lid back on top of the tank. **Special care must be taken to ensure the electrodes do not touch the walls of the tank or get scratched by touching any metal piece.**
- Install the piston.
The piston (in large LPB units) is installed after the lid has been put in place and securely bolted.
Attach the piston to the blue adaptor piece. Pull the shaft out of the piston house about 20cm (so that it comes also out of the blue adaptor piece). Screw the piston shaft to the shaft extension popping out of the lid. Remove the temporary screw that hold the scraper from falling and fasten the adaptor piece to the lid. Connect the air tubes.
- Connect incoming water line (from the pump discharge) to inlet valve .
- Connect treated water line to outlet connection.
- Connect drain valve to drainage system. It is always beneficial if one can see the draining water.
- Connect air supply to air intake.
- **Important:** When handling the LPB unit, it is absolutely imperative not to pull or to exercise any pressure on the piston. Even the smallest deformity could hamper the functioning of the piston

Electrical connections

- Open the power supply door and expose the electrical connections. To expose the electrical connections, remove the plastic cover at the bottom. All the appropriate connectors are marked.
- Check that all seen wires are tight. During the shipping some of the screws may loosen. Tighten them up.
- If not connected, connect the electrodes to the power supply using wires supplied with unit. The connection point is on the left side of the power supply control panel. Note that the (-) side of the power supply unit is already connected to the tank!
- Connect electrical feed to the appropriate connections in the power supply unit (L,N,E).
- Pump control in large LPB unit: It is recommended that the pump stops during flushing of the system. This is achieved by connecting the pump control 24 V relay through a contact, which is controlled by point No 16 Timer IN. Contacts marked "C" and "NC" are provided for this purpose and are already connected to Time IN. These contacts are located on the right hand side of the panel next to the 24hours clock. The pump should be connected via these contacts.
- The LPB system was adjusted in the plant and there is no need for new adjustments before starting. Check the setting of the 24 hour clock. Make sure that for each setting 2 adjacent pins are pushed towards the scale direction of the clock.
- The electric current (DC) to the electrodes is adjusted to the maximum current of the power supply (Constant Current), and may need readjusting when starting the unit.
- **The electrical current in this LPB system should be 4 ampere. In the power supply there are 10 leds. Each one mark 1 ampere.**
- Check the timer adjustment. Timer D should always be longer than timer IN.
- On the left side of the electrical panel, above the connectors' line, are two holes for accessing two variable resistors for adjustment: the upper hole for maximum voltage adjustment (marked as volt adj.) and the lower hole for current adjustment (marked as current adj.). The Volt Adjustment button is set to maximum and should not be touched. The current adjustment can be set by manufacturer trained representative to increase the unit capacity. Please consult manufacturer before adjusting the current.
- Maximum voltage that can be obtained from this power supply is 50V.

- Maximum current that can be obtained from this power supply is 10A .
- Opening the unit (for cleaning or maintenance purpose)**

Make Sure The Unit Is Disconnected From The Electricity

The LPB is equipped with arrangements that allow removing the piston without the need to open the lid. It also allows removing the lid without having to pull the electrodes and the guide rod.

The lid is fastened to the tank. The scraper disc, electrodes and guide rods are all attached to it on the inside.

In order to open the unit and remove the lid and the internals for cleaning follow the next procedure:

1. Dismantle the piston:
To do this, you have to open the 4 bolts on the piston adaptor. Pull the complete piston house upward so that the shaft and the shaft extension can be seen. The shaft extension has a special hole drilled in it so that a temporary pin can be inserted in as a stopper to hold the scraper disc from falling inside the tank. Insert this pin.
At this position you can open the lid bolts and lift it carefully.
2. Dismantle internal parts:
In order not to pull the electrodes out of the tank, a tool must be prepared, which allows you to lift the lid about 100mm above the tank flange. In this position the electrodes and the guide rod can be unscrewed from the lid so that the lid can be removed and the electrodes and the guide rod can be left in the tank. Slide your hand into the tank just under the lid and unscrew the electrodes and the guide rod. Place them carefully inside the tank. Removed the lid together with the scraper fastened to it.
3. Pull the electrodes and the guide rod from the tank and place them carefully on the side. Make sure the electrodes are not scratched by foreign matters.
4. Separate the scraper from the lid in order to clean the lid if necessary.

Closing the unit (After cleaning or maintenance)

1. Put the internal parts back into the tank.
2. Mount the scraper as follows:
The polypropylene scraper is fastened to the lid according to the drawing attached . Connect the PP scraper to the small shaft extension and slide in through the lid. The extension has a hole through which temporary pin can be inserted to hold it from falling down. Insert the pin into the hole. In this position put the lid back on the tank on the support that holds it about 100mm higher than the tank flange.
3. Slide your hand under the lid and fasten again the electrodes and the guide rod. Make sure the bolts holding the electrodes are tightly closed and the gaskets are in place.

Operation

Commissioning and testing

After installation has finished, it is recommended that the unit be tested without water. For this purpose, the pump must be shut off.

Connect to electricity and check the following:

Inlet valve should be open (normal position).

Piston should be up.

Drain valve should be closed (normal position).

DC Volts reading should be 50V.

Green operating light on the panel door should be on.

Start manual flush on the 24V clock by pushing the switch at the bottom of the clock down to off position.. Check the following:

Flush green light on the panel door is on.

Inlet valve closes.

Inlet valve should close.

The drain valve should open.

The piston should move downward. In units where 3 timers are provided, the piston will move at this stage up and down as long as the Timer D is activated and the drain valve is open.

Timers IN D and P should start counting. The green light on these timers will flush.

During counting time of Timer IN, voltage reading on connectors C,NC (the pump control) should show 24V.

After set time IN, the Timer IN will stop counting. The red light on the timer will come on and the green light will be stable. The inlet valve will open.

After set time D, the timer D will stop counting. The red light on the timer will come on and the green light will be stable. The drain valve will close and the piston will move back up.

Put the button of the clock back to Auto (or On). This will reset the timers and will enable automatic flushing.

It is very important to ensure that the clock button is on the auto/on position. Failing this, the unit will not flush itself and will not work.

Check pump impeller rotation direction is correct.

Starting Operation

Before starting, stop any blow down other than the blow down from the LPB unit. It is necessary that all blow down is controlled by the LPB.

1. Connect to power {110VAC -60Hz for USA, 230V-50Hz for Europe}. Turn on power (the main breaker can be used for this purpose – refer to drawing No. 1).
2. Confirm that operation green light is on.
3. Check that dedicated circulation pump is functioning properly (check for proper impeller rotation direction).
4. Discontinue adding any chemical additives.
5. Ensure that no other drain but that of the LPB is operating.
6. Observe the voltage and current of the unit. Adjust as may be required.
7. Activate manual flushing. To do this you have to switch the 24 hours clock to manual (or off) position. The switch is located at the bottom of the clock. A flushing cycle will be initiated. At the end of the cycle the switch must be returned to the automatic position.

DO NOT FORGET TO TURN THE OFF-AUTO SWITCH OF THE CLOCK TO AUTO. Failing to do so, there will be no flushing of the unit until this is rectified.

Adjusting timers & clock:

During normal operation, it may be found that the factory adjustments are not optimal for the water situation. In such a case, on site adjustment may be required.

The power supply unit is equipped with a 24hours adjustable timer clock to set the desired time of the day when the flushing will be done (frequency of the flushing). It is also equipped with 3 timers that determine the duration of the scale flushing cycle in the reaction tank and the movement of the piston up and down. All these units have been pre-adjusted but can be readjusted on site if required.

Timer IN controls the main water inlet valve.

Timer D controls the piston and the drain valve.

Timer P controls the piston movement up and down. This timer is available only on 25amps units.

How does it work:

The LPB operation cycle is controlled by the adjustable time clock. When the time comes to flush the unit, the clock sends a 24V AC signal to all timers. Upon this signal, inlet valve will and the drain valve will open. The scraper will start moving up and down controlled by Timer **P** during the full cycle as long as the drain valve is open. After a predetermined time [t1], Timer **In** will open the water inlet valve to allow flushing with water. After a second predetermined time [t2] (longer than [t1]), Timer **D** will close the drain valve and stops the scraper operation. The clock will de-activate the timers and reset them for operation in the next cycle.

The clock and timers has been factory adjusted to activate the flushing cycle two - five (2-5) times a day).

Clock adjustment:

The clock is a 24 hour clock and is equipped with “needles” around it. Pushing a needle towards the scale side of the clock will mark the time of the day at which flush cycle will be activated. One can push any combination of needles to activate the flush cycle at different hours of the day. (Similar to clocks used for hot water boilers).

Adjusting the clock is that simple. Just push the number of needles required at the hours you wish your system to do a flushing operation. It is recommended to push 2 adjacent needles for every flush time to ensure the flushing.

The clock is also equipped with a switch for auto or manual operation. This switch is located at the bottom of the clock. Some of the clocks have a 3 position switch and some 2 position switch. In all cases the bottom position is the manual position. In the 3 position switch the middle position is for automatic operation and the top position is off.

Always make sure that the bottom switch is on the auto position.

Timer's adjustment:

The timers IN and D are each equipped with 2 adjusting knobs. The top knob has a scale for adjusting the time for the timer to count. The bottom knob has 4 positions each having a different range. Always make sure the bottom knob points to A or B. The time range for position A is 15 to 150 seconds and the time range for position B is 60 to 600 seconds. The time of any of the operation controlled by each of the timers can be adjusted by turning the upper knob clockwise (to increase time) or counter clockwise (to decrease time). The factory adjustment is marked on the timers.

Timer P has only simple time scale for adjustment.

Current adjustment:

The current is set at the factory randomly. When starting the system, the current and voltage must be detected. The 25amp power supply is equipped with ampermeter and voltmeter but for other unit an external instrument must be used. The current should be set to maximum according to the specific

power supply. It may drop later if the voltage reaches 50V. The adjustment is done by inserting a screw driver marked amp adjust and turning it counterclockwise.

Monitoring *LPB* Operation

The power supply panel contains three indicator lights:

- -Green indicator light indicates that system is operating.
- -Second Green indicator light indicates that rinsing is in progress.
- -Red indicator light indicates that system is in fault.

Flushing the *LPB* unit

The *LPB* system is fully automatic. No manual intervention is required.

When flushing starts, the inlet valve closes and the drain valve opens.

Piston activates the wiper that wipes the scale from the tank walls.

After a pre-set period of time, the water inlet valve opens to commence flushing the scale, and subsequently, the drain valve closes, the piston returns to its place and the *LPB* resumes normal operation.

Adjustment of Parameters

Occasionally, the water parameters call for adjustment of the *LPB* operation. The following adjustments can be done:

- Ampere current adjustment. Assuming the resistivity does not change, increasing the amps will bring the voltage up. Adjusting the current is done by turning the screw in the blue knob on the left side of the power supply. Turning the knob in counter clockwise direction will increase the current. Clockwise rotation of the knob will decrease the current.
- Changing the frequency of drains.
This is done by adjusting the timer clock to as many operations per day (see timers and clock adjusting above) to receive the required flushing frequency.

Do not leave the LPB full of standing water and connected to the electricity for more than few hours.

To shut the unit down, the following steps must be taken:
Drain and flush the LPB manually according to the manual flush procedure.
Switch off electricity.
Open and clean following opening and closing procedure on page 9 above.

When operation resumes, check manually that all valves and piston are working. Open the water and re-connect to the electricity. Do a manual flush for checking that the unit is operative.

Do not forget to switch the timer clock back to Automatic Operation.

Troubleshooting the LPB

LPB Red Light On

This indicates a high content of salts, specifically scale being accumulated in the tank and in the hot water tank..

Since the current is kept constant, if the resistivity goes lower, the voltage subsequently follows and under 7V the red light will turn on.

LPB solenoid valves

On the outer side of the panel there are 2 or 3 solenoid valves. These valves control the inlet valve, outlet valve and the piston.

Each valve has a red switch, which can be used for the manual control of the system either by pushing or by turning. Pushing will allow only one operation of the valve, while turning changes the operation of the solenoid valve from automatic to manual. It is strongly advised to use only the pushing option (in order not to leave the system in undesired working position).

Forced LPB cleaning operation check

The clock has a switch that can alternates between automatic and manual position.

In normal operation status (auto), the button is in auto position

To check the correct functioning of the system, switch to manual position to force a cleaning operation. In the manual position, the system operates exactly as if in normal flushing cycle situation.

1. The automatic inlet valve closes

2. The automatic drainage valve opens
3. The piston goes up and down to clean the cylinder throughout the flushing cycle.
4. After a pre-set period of time the inlet valve opens and water enters for final flushing.
5. After a second pre-determined period of time the drain valve closes and the piston returns to the upper position. The system resumes normal operation.
6. Return the switch of the clock to auto position.

It is very important to return the switch to the 'auto' position after the check is completed to resume normal operation. Failing to do so, the system will not flush!

Maintenance

The system requires 2 maintenance procedures: bi-weekly and annual.

LPB bi-weekly maintenance

- Piston: the piston has to be constantly in a lubricated condition. The LPB has a small oil box at the connection area of the piston to the scraper. Once in two weeks, it should be checked to ensure the box is filled with oil.
- Do a forced flush. During normal operation, the piston is in the upper position. It is easy to see the piston position while doing a forced flush by watching for the operation of the piston shaft at the greasing point.
- Check that during normal operation there is air pressure in the lower (inlet) nozzle of the piston. This air pressure keeps the piston in the upper position. If for some reason the piston will remain in the lower position, the system is damaged and will not function.
- The LPB air intake system is equipped with an air filter, which contains a drainage nozzle. Drain the water in the air filter cup by pushing the knob. At the head of the air filter there is a valve for calibrating the air pressure. By turning the valve clockwise, air pressure is being

increased. This valve is pre calibrated for maximum pressure.

- Check that the connecting bolts of the electrodes are tightly secured. This is important in order to prevent water leaking into the top side of the electrodes.
- Check that the external tips of the electrodes are impeccably clean. If stained or damaged, contact the supplier to investigate the cause and how to repair or replace.

LPB annual maintenance

At least once a year the system requires a thorough cleaning. Where the load is very heavy, twice a year will be recommended.

Annual maintenance will be performed by the factory authorized representative.

For the purpose of this cleaning the system must be disconnected from the Electricity.

Disconnect the air from the system and the electricity from the electrode.

The bolts of the top cover of the tank must be opened and the cover carefully removed. During this operation care must be taken not to damage the electrodes.

The electrodes must appear clean even after a long period of operation. If it is not clean, the manufacturer must be consulted.

The internal wall of the tank must be manually cleaned. The disc of the scraper must also be cleaned. It is expected that some scale would stick to the tank walls and to the scraper and this has to be removed.

After this thorough cleaning, the cover must be returned to its place, the bolts fastened and the unit can be then re-connected to electricity and process streams.