Operation & Maintenance Manual

Norweco Singulair® Bio-Kinetic® Model 960 and
Singulair Green® Bio-Kinetic® Model 960
Wastewater Treatment Systems

1/1/2022

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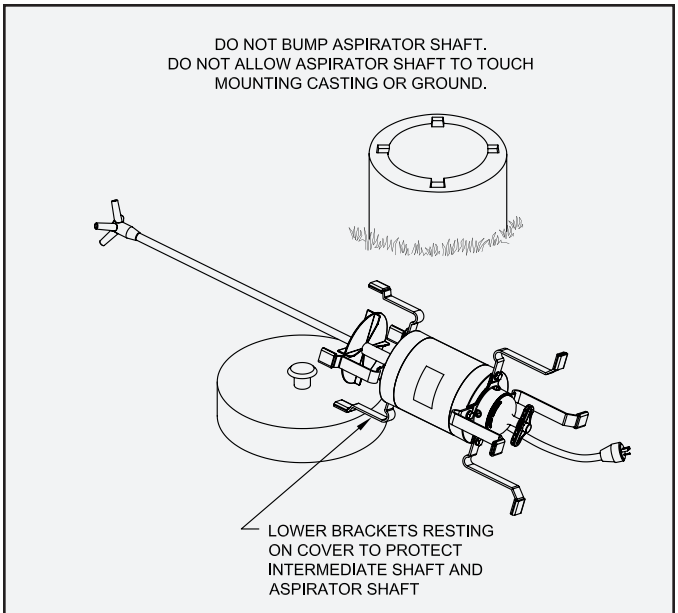
BIO-KINETIC® WASTEWATER TREATMENT SYSTEM

SINGULAIR® AERATOR SERVICE

The Singulair aerator has been specifically designed for use in the Singulair system and is the only electro-mechanical component. It provides maximum air introduction, thorough mixing and assures reliable, economical wastewater treatment. For Singulair systems requiring more than one aerator, follow these instructions for each aerator and aeration chamber. The Singulair aerator is factory lubricated for the life of the unit. No service inside the aerator is required. Unauthorized disassembly will void the warranty.

CAUTION: Any time an aerator or test equipment is connected or disconnected, first shut "off" the selector switch in each control center. Failure to do so could result in personal injury or equipment damage.

1. Open the control center and push the reset button on the Service Pro panel.
2. As you approach the Singulair tank, listen for excessive noise before removing the vented cover.
3. Remove the vented access cover located above the aeration chamber and place it aside. The aerator should be operating normally.
4. Make sure the debris screens are in place in the air intake ports. Manually check the aerator brackets for excessive vibration.
5. Check the aeration chamber for odor. A musty odor indicates the presence of aerobic conditions essential for good treatment. A septic odor indicates inadequate aeration, suggesting that the passage of air into the tank contents has been restricted.
6. Carefully remove the debris screens from the air intake ports. Wipe the aerator air intake ports with a damp cloth being careful not to allow dirt or debris to enter the intake openings.
7. Using the Singulair flowmeter, check the air delivery. It should read approximately 3 CFM. Refer to the Singulair Aerator Flowmeter instruction sheet for complete details.
8. Inspect the outside of the electrical connector assembly for worn spots. Uncouple the connector and check for any evidence of moisture inside. Secure the closure cap over the female half of the connector to keep it clean and dry while you work.
9. Within 2-3 minutes after turning off the aerator, perform a settleable solids test of the aeration chamber contents. Refer to Singulair Tank Pumping instructions for details.
10. Remove the aerator from the mounting casting. BE CAREFUL when removing the aerator to see that the aspirator shaft does not come in contact with the mounting casting. The aspirator shaft is straightened to a critical tolerance before it is shipped from the factory. It must retain this straightness tolerance or vibration may result. Excessive vibration can greatly shorten aerator life and could also cause the unit to consume more electrical power than necessary.
11. Check the rubber shock absorbers on each bracket for wear. Replace any that are missing or worn.
12. Check the power cord from the moisture resistant electrical connector to the aerator. Be sure it is free of nicks or worn spots.
13. Lay the aerator on its side against the aerator mounting casting or vented cover. Check to see if there is a water mark on the outside of the aerator and notify the owner if one is found. The aerator is flood proof and mechanically designed so that it can return to normal operation unharmed after being subjected to intermittent high water. However, a high water mark on the outside of the aerator does indicate there is a problem in the effluent disposal line, disposal field or elsewhere in the installation. If the problem is left uncorrected, wastewater could back up into the tank, void the aerator warranty and eventually flood the facility.
14. Carefully loosen the two stainless steel set screws on the bottom of the intermediate shaft and remove the



PLACE AERATOR AGAINST COVER

SINGULAIR® AERATOR SERVICE (Cont.)

aspirator shaft. Remove any internal deposits from the four aspirator orifices with the aspirator shaft cleaning tool. Connect the aspirator shaft to the shaft cleaning hose and outside water faucet to flush the inside of the aspirator shaft clean. Use full water pressure. Remove the shaft from the cleaning hose and inspect the bore to see that it is clean.

15. Push the stainless steel brush with extension handle through the stainless steel intermediate shaft and hollow motor shaft to dislodge any residue that may have accumulated. **NOTE:** Do not flush the motor shaft with water. Remove any debris from the air intake openings.
16. Thoroughly clean both the bottom and the top surfaces of the foam restrictor.
17. Reinstall the aspirator shaft into the intermediate shaft. Match the permanent alignment marks on the aspirator and intermediate shafts to maintain the original factory balance. Tighten the set screws with a tee-handle allen wrench, finger tight only. Too much pressure may dish the side of the aspirator shaft and compromise the straightness tolerance.
18. Visually check the aeration chamber surface for the presence of grease or oil. An accumulation of these materials indicates the pretreatment chamber should be evaluated. Refer to Singulair Tank Pumping instructions for details.
19. Check the aeration chamber for the presence of non-biodegradable materials. Accumulation of these materials in the aeration chamber indicates the pretreatment chamber should be evaluated. Refer to Singulair Tank Pumping instructions for details.
20. Inspect the underground power cable in the aerator mounting casting for breaks or scars in the insulation. Examine the inside of the mounting casting and riser for evidence of ground water entry.
21. Carefully reinstall the aerator in the mounting casting. Do not allow the aspirator shaft to touch the mounting casting side walls. Make sure the weight of the aerator is evenly distributed on the upper end of all four mounting brackets.
22. Using a multi-meter, check the voltage at the electrical connector. The meter should read 115 volts ± 5% for systems equipped with electro-mechanical control centers and zero volts for systems with Service Pro controls. Record the voltage on the Service Inspection Card.
23. Wipe the aerator electrical connector with a clean, dry cloth to remove moisture or dirt accumulated during service. Plug the electrical test pigtail in between the male and female electrical connectors and check the amperage of the newly serviced aerator. The aerator should not draw more than 3.8 amps. Record the amperage on the Service Inspection Card.
24. Clean or replace the four air intake debris screens. Make sure one screen is placed in each intake opening to prevent debris from entering the aerator.
25. Inspect the vent cap in the aerator access cover and clear the fresh air openings of any debris to insure unrestricted passage of air. Reinstall the access cover on the mounting casting. **DANGER: Make sure the system access cover is in good condition and securely installed on the mounting casting. Never allow access risers to be left uncovered or partially covered. Failure to secure access covers and safety nets could result in bodily injury, illness or death. Riser safety nets are available from Norweco for concrete or plastic risers.**
26. Make the appropriate notations regarding the aerator, the results of the settleable solids test and related items on the Service Inspection Card.
27. Proceed with clarification chamber service as outlined in Clarification Chamber and Bio-Kinetic Service instructions. When the routine service is complete, return to the control center and restore the Singulair system to the proper operating time cycle for this installation. Close the control center cover and secure it with a new tamper evident seal.

IF AN AERATOR MUST BE REMOVED

The service technician should be able to restore most installations to full operation during the initial service call. If the aerator is no longer eligible for the three-year limited warranty, the aerator should be removed and replaced with a remanufactured and fully warranted exchange unit from your rotating stock. This will become the permanent aerator in service at the facility and your company's service records should be updated to reflect the new aerator serial number. If the serial number portion of the Warranty Registration Card is still attached to the control center, be sure to fill in the new serial number for the owner. When you have accumulated several aerators requiring factory service, return them to Norweco. This reduces administrative time and the cost of shipment per unit. When remanufactured aerators are returned to you, add them to your rotating stock. In this way, the installation is restored to full service with a fully warranted unit in only one service trip.

EXCHANGE AERATOR COSTS

You may compute exact costs for exchange aerators during your service inspection since the cost is determined by system age, regardless of condition. Exchange rates are given on the Singulair Warranty and Exchange Program data sheet. In cases where the aerator has failed under warranty, you should replace it with a loaner unit to insure continued operation of the system and protect effluent quality. Return the warranted unit to the factory immediately for replacement and schedule reinstallation with the owner at the earliest possible convenience when it is returned to you.

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BIO-KINETIC® WASTEWATER TREATMENT SYSTEM

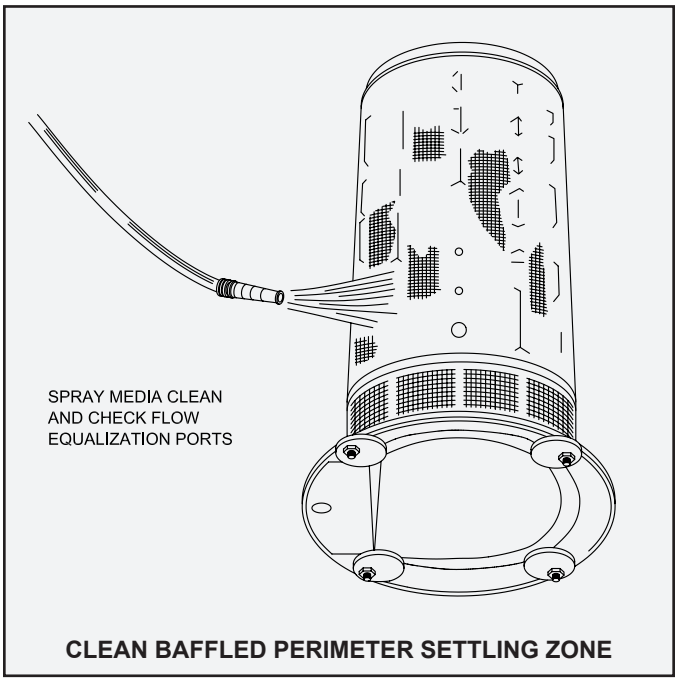
CLEANING AND DISASSEMBLY INSTRUCTIONS FOR THE BIO-KINETIC® SYSTEM

EQUIPMENT REQUIRED FROM THE BIO-KINETIC SYSTEM TOOL KADDY

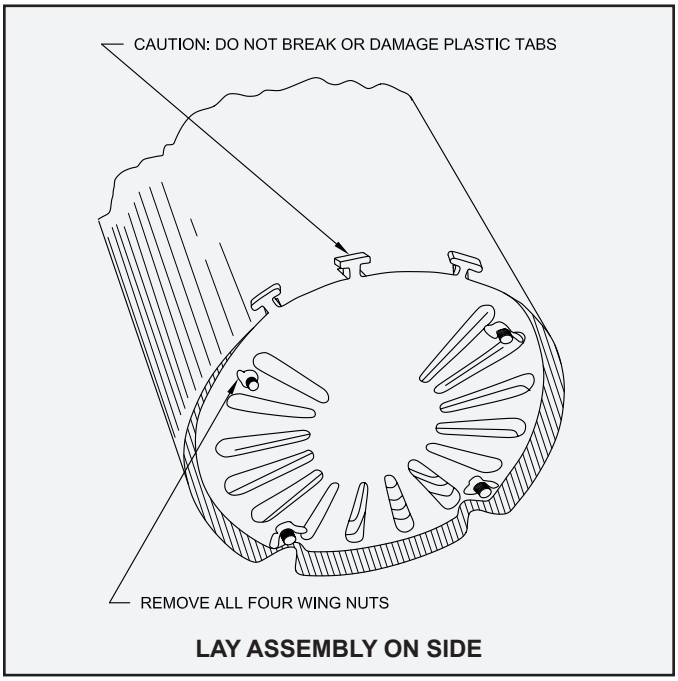
- ❑ water hose and spray nozzle
- ❑ Bio-Kinetic system universal tool
- ❑ rubber gloves
- ❑ safety face shield or goggles
- ❑ ratchet drive and $^{7}/_{16}$" socket

A fresh water supply and sewer drain are required for cleaning the Bio-Kinetic system.

1. Remove the Bio-Kinetic system from the service container. Rinse the container and lid. Rotate the four locking lugs to the outboard position on the Bio-Kinetic system. Remove the gasketed discharge flange assembly from the flow deck and rinse it with water.
2. Grasp the top flange of the system with one hand and insert the disassembly tool beneath each of the strap handles on the flow deck. Pull up on the disassembly tool to remove the flow deck and internal system components from the contact chamber and set aside. Use the water hose and spray nozzle to wash the inside of the contact chamber.
3. Use the water hose and spray nozzle to wash off the filter media. Continue spraying until all sludge and wastewater have been flushed from the media. Invert the filter assembly and flush accumulated material from the baffled perimeter settling zone. Inspect the perimeter settling zone to be certain that it is totally clean. Check the flow equalization ports to be sure they are clean and unobstructed.
4. Wash off any debris that has accumulated on the surface of the flow distribution deck and baffle wall shroud. Lay the assembly down on its side and remove the four wing nuts on the bottom. Remove and wash the bottom deck plate.



CLEAN BAFFLED PERIMETER SETTLING ZONE



LAY ASSEMBLY ON SIDE

CAUTION: Do not break or damage the molded plastic tabs on the edge of the bottom deck plate.

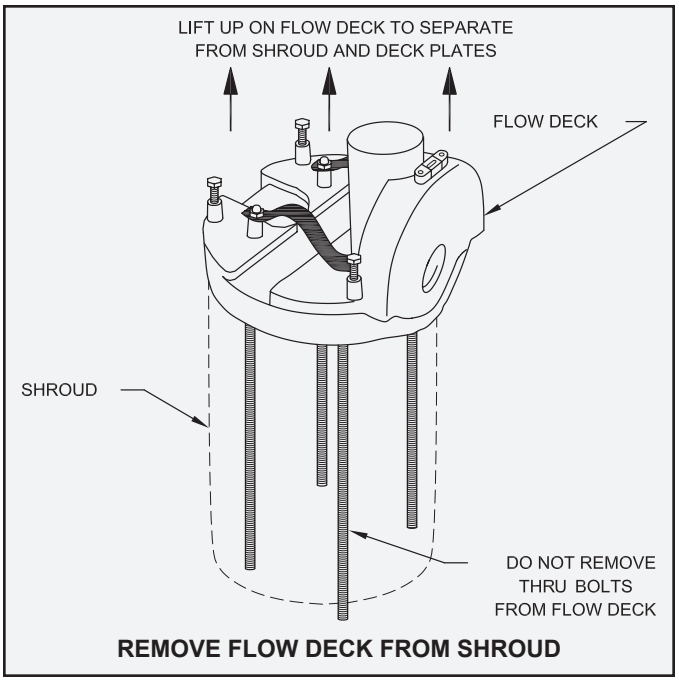
Do not remove the remaining deck plates at this time. Stand the assembly upright and lift up on the flow distribution deck to separate it from the baffle wall shroud and deck plates. You may find it helpful to hold the baffle shroud between your feet when lifting up on the flow deck.

NOTE: The thru bolts will be removed from the shroud and deck plates when the flow deck is lifted off the baffle

BIO-KINETIC® SYSTEM CLEANING AND DISASSEMBLY INSTRUCTIONS (Cont.)

wall shroud. Do not remove the thru bolts from the flow distribution deck. Rinse the flow distribution deck thoroughly inside and out. Inspect the weir and final discharge zone to be sure they are completely clean.

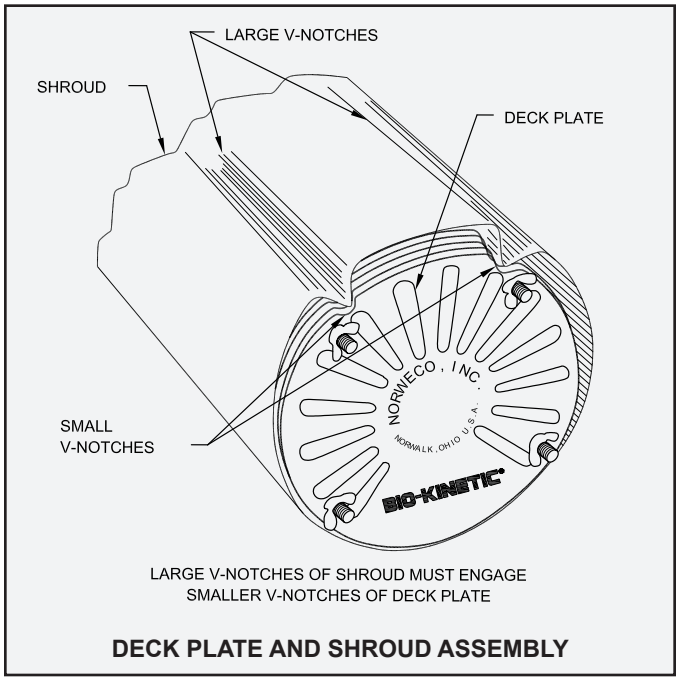
5. Lift up the baffle wall shroud to remove it from the deck plates. Rinse the inside and outside of the shroud and set it aside. Take the cleaned, round bottom deck plate and set it on the floor with the engraved name facing down.
6. Remove the top deck plate from the remaining stack and wash off both sides. When cleaned, set it on top of the cleaned, round bottom deck plate. Repeat this procedure with each deck plate until all plates are cleaned and reassembled into a single stack. Each deck plate is molded with four circular depressions in the bottom side of the plate and four round stand-off posts in the top side of the plate. When restacking the clean deck plates, make sure the four depressions on the bottom engage the top of the four posts below. All



REMOVE FLOW DECK FROM SHROUD

deck plates must be placed onto the stack baffle side up (engraving down). When properly assembled, all edges of each plate should be vertically aligned.

7. Lower the baffle wall shroud over the assembled stack of deck plates. The two large V-notches in the shroud should engage the smaller notches on the edge of the deck plates. Check the four leveling lugs on the flow deck. They must be unscrewed until they are flush with the bottom of the flow deck. Now position the flow distribution deck above the baffle wall shroud so that the outlet of the flow distribution deck is directly opposite the two large V-notches in the shroud. Insert each of the four thru bolts through the holes in the top of the baffle shroud and into the stack of deck plates. Lower the flow distribution deck until it fully engages



DECK PLATE AND SHROUD ASSEMBLY

the top of the baffle shroud. Push each thru bolt down into the assembly as far as it will go.

8. Lay the assembly on its side and push the thru bolts through the bottom deck plate. Fasten a wing nut to each of the four through bolts where they project through the bottom deck plate. While tightening each wing nut, make sure the molded plastic tabs on the bottom deck plate engage the slots on the edge of the shroud. Tighten enough to insure all three tabs are fully engaged into the three slots in the shroud.
9. Lubricate the grommet in the outlet opening of the contact chamber. Grasp the strap handles and lower the flow deck and internal components into the cleaned contact chamber making sure to align the flow deck outlet with the outlet of the contact chamber. Apply a moderate amount of downward force until the outlet of the flow distribution deck aligns with the outlet of the contact chamber.
10. Place the assembled Bio-Kinetic system back into the cleaned service container. Place the discharge flange assembly onto the flow distribution deck. Now place the service container cover into position by aligning the four holes in the cover with the locking lug bolts. Add a wing nut to each of the lug bolts to hold the cover in place. Return the container to your service stock.

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BIO-KINETIC® WASTEWATER TREATMENT SYSTEM

SINGULAIR® SYSTEM AND CONTROL CENTER SERVICE

To maximize owner protection, the Singulair Bio-Kinetic wastewater treatment system is backed by a three year limited warranty on system components and a lifetime aerator exchange program. The initial selling price includes a series of four prescheduled service inspections at six month intervals which cover the first two years of system operation. These inspections should completely familiarize the owner with the Singulair Bio-Kinetic wastewater treatment system and answer any questions that arise. Carefully check all component parts of the Singulair system to insure proper operation and overall wastewater treatment quality. Regular service inspections by qualified technicians establish an excellent relationship with the owner as well as with local health officials. They must be performed faithfully to keep you up-to-date on the performance of each Singulair system you have installed.

While making service inspections during the intial two year period, be sure to explain to the owner that they are being performed at no charge and that the same coverage can be renewed on a continuing basis at a nominal charge following the initial two year program. Point out the advantages of continuous protection with the service contract. Be sure to remember that service contract sales have advantages for the distributor as well. They result in more efficient service inspection scheduling with more actual “service time” and less “travel time” per day. These savings can be passed on to the owner through more attractive renewal contract fees in future years.

All of the equipment and tools needed for Singulair system service work are contained in the Singulair field service cart and Tool Kaddy. You will also need exchange Bio-Kinetic systems, a supply of Blue Crystal disinfecting tablets and a supply of Bio-Neutralizer dechlorination tablets. Bio-Kinetic systems may be supplied with or without Blue Crystal and Bio-Neutralizer chemical feed systems. Therefore, check your Distributor Service and Warranty Record Card carefully to be sure you have selected exchange Bio-Kinetic systems with correct flow distribution decks.

SINGULAIR SYSTEM SERVICE PROVIDES CONTINUOUS OWNER PROTECTION WITH THESE ADVANTAGES

- Travel and labor costs during service inspections are provided at no charge to the owner.
- Special service calls that may be necessary during the program are performed at no charge to the owner.
- Owner’s investment, property and the environment are fully protected.
- Guaranteed response to emergency service requests is made within forty-eight hours.
- Local health department is automatically notified of system condition by the distributor.
- Owner has an up-to-date, written record of the condition of the Singulair aerator, control center and Bio-Kinetic system.
- Owner is continuously informed of the treatment quality provided by the system.
- Routine maintenance is performed by factory-trained service technicians; no owner maintenance is required.
- Owner can expect maximum aerator life and minimal power consumption costs due to regular, qualified service visits.

These instructions are designed to cover the important points of Singulair Bio-Kinetic system operation which should be checked during each service inspection. They have been arranged in normal service order to assure that you make the most efficient use of your time. While a visual check is normally sufficient to be certain that each item is in proper working order, several items listed in this manual are indications of potential problems. If anything unusual is encountered, refer to the Singulair Troubleshooting Guide.

NORWECO PRESCHEDULED SERVICE INSPECTIONS (Cont.)

Before you leave your plant

- Be sure you have a complete list of service needs in the area you are going to work.
- Check to see that you have detailed directions to each installation.
- Be sure your service vehicle is fully stocked.

When you arrive at the site

- Meet the owner. Introduce yourself and present your business card.
- Explain the service inspection program and outline what you will do. Mention that your services are at no charge.
- Ask for permission to inspect the Singulair control center and tankage.
- Make sure the owner has a copy of the Owner's Manual, serial number tag and previous Service Inspection Record Cards.
- Suggest that the owner record the information from the Service Inspection Record Card in the Supplemental Service Record Section of the Owner's Manual.
- Ask if there are any questions concerning the system or its operation.

CONTROL CENTER SERVICE

CAUTION: If your visual inspection of the Singulair control center reveals a problem, be sure to shut off the appropriate circuit breaker in the main service panel - then test all circuits with the electrical multi-meter to be sure they are de-energized before proceeding.

1. If there is no evidence of an electrical problem, check the main service panel to see that the circuit breaker for each Singulair system is turned on.
2. Make sure the panel is turned on and the power indicator light is on. If there are any alarm lights activated, refer to the Singulair quick start guide for further diagnostic instructions.
3. See that your company's identification label is affixed to the Singulair control center and is legible. Replace the label if necessary.
4. Make sure that the aerator model number and serial number tag is attached to the control center or has been stored by the owner in a secure location. If it has been misplaced, provide a new one and fill in the appropriate information.
5. See that the Owner's Manual has been stored by the owner in a secure location. If it has been misplaced, supply the owner with a new one.
6. Inspect the wiring from the control center to the aerator, as far as it is visible, and notify the owner if you see any damaged areas.
7. As you leave, make sure the Singulair control center is turned on and there are no active alarms. Secure the Singulair control center with a new tamper evident seal.
8. Make appropriate notations on the condition of the electrical control center on the Service Inspection Record Card.

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CONTROL CENTER WITH MCD TECHNOLOGY

TIME CLOCK SETTING AND SERVICE INSTRUCTIONS

The design of the Singulair system incorporates 48 hour retention and non-mechanical flow equalization to provide continuous treatment. The performance of the Singulair system has been tested and certified with the aerator operating on a minimum run cycle of 30 minutes per hour and no adjustment should be made to the factory preset time clock setting without following the detailed steps outlined in these instructions.

INTRODUCTION

The biological processes in the aeration chamber of the Singulair system convert wastewater to microorganisms, carbon dioxide and water. The Singulair system is designed so that the aerator will operate 30 minutes out of each hour. Under typical organic loading conditions, this run cycle will maintain a balance between organic loading and the level of microorganisms in the aeration chamber. If an increase in organic loading occurs, increasing the aerator run time will result in additional aerobic digestion and allow the biological balance to be maintained. Prior to adjusting the aerator run cycle, a complete Singulair system service inspection, including pretreatment chamber evaluation, aerator service and measurement of air delivery must be performed. Whenever the pretreatment chamber is pumped, the system should be given time to achieve a biological balance before considering time cycle adjustment. Adjustments to the aerator run cycle should not be made within one week of any other system process changes, including system pump out or extended vacation.

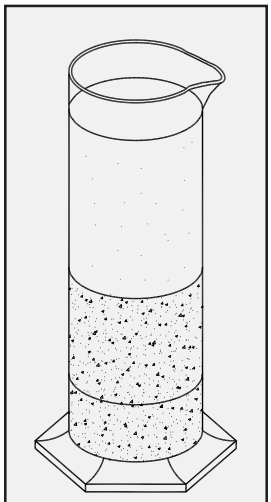
NITRIFICATION AND DENITRIFICATION

Nitrification is the oxidation of nitrogen compounds (primarily ammonia) that results in the production of nitrates. This process improves the quality of the effluent returned to the environment and is an important step in wastewater treatment. Nitrification is routinely performed by the Singulair system and the level of performance is directly linked to biological balance within the system.

Denitrification will only occur if nitrification has already taken place. Denitrification is the process of breaking down nitrates into oxygen and nitrogen. The Bio-Static sludge return prevents denitrification (sludge bulking) in the clarification chamber by continuously returning solids to the aeration chamber. Denitrification will occur in the aeration chamber if the aerator time cycle is properly adjusted. To accomplish denitrification, the aerator off cycle must be long enough to allow the aerobic bacteria to consume the available dissolved oxygen and the nitrate bound oxygen, thereby returning the nitrogen to its natural state. It is important that the aerator have a long enough off cycle to deplete dissolved oxygen levels in the aeration chamber in order to achieve partial or total denitrification.

SETTLEABLE SOLIDS TEST

To determine if an adjustment to the aerator run cycle is required, a Settleable Solids Test must be conducted. See Singulair Tank Pumping Instructions for details on performing this test. Too much air being introduced to the system (overaeration) will negatively affect operating characteristics. This condition is indicated by finely divided particles and/or crisp, white foam floating in the Settleable Solids Test or aeration chamber. The supernatant will be turbid (cloudy) with fine suspended particles (pin floc). Solids will be lighter brown, almost white, in color. Overaeration will not allow proper settling of the treated wastewater and may adversely affect system performance. Likewise, too little air being introduced to the system (underaeration) will cause the system to operate at less than its maximum efficiency. Underaeration is indicated by darker and more coarse solids in the Settleable Solids Test or aeration chamber and may have a dark, thick foam or scum layer on the top. This condition is similar in appearance to organic overloading and the system may have a foul or septic odor. The supernatant will have a grey, almost dishwater, appearance. Solids will have a grainy appearance and will settle more compactly due to their thickness and greater density.



SET. SOL. TEST

To check for nitrification during the Settleable Solids Test, allow the sample to sit undisturbed for 2 to 3 hours. The nitrogen (fine bubbles) being released should cause all or a portion of the solids to float to the top. This process is called sludge bulking and is actually denitrification occurring in the sample container. The solids may then break up and settle to the bottom of the sample. For Singulair systems with more than one aerator, the Settleable Solids Test should be conducted on a sample from each aeration chamber. The results of all tests should be averaged to evaluate system operation.

TIME CLOCK SETTING AND SERVICE INSTRUCTIONS (Cont.)

The results of the Settleable Solids Test should be evaluated using the following chart:

Settleable Solids Test Result			Condition Indicated	Adjustment Required
Color of Solids and Liquids	**Settled Solids Volume**	**Additional Observations**		
Very light brown solids with gray cloudy liquid.	Less than 25%.	Some surface foam. Poor separation and settling of solids.	Hydraulic overloading, organic underloading, or system has not yet reached process maturity.	No adjustment until process maturity is reached. If mature and properly loaded, decrease aerator run time. DO NOT decrease run time to less than 30 minutes per hour.
Light to medium chocolate brown solids with clear liquid.	25% to 50%.	No foam.	Proper operation.	None.
Medium to dark chocolate brown solids with clear liquid.	50% to 75%.	No foam.	Proper operation.	None.
Very dark brown solids with cloudy brown liquid.	Greater than 75%.	Dense sludge with rapid settling.	Organic overloading.	Evaluate pretreatment chamber. Increase aerator run time if required.
Black solids with gray liquid.	In any volume.	Foul odor and finely divided particles.	Toxic material in influent.	Evaluate system per Singulair Service Manual. Review Owner's Manual with owner.

DISSOLVED OXYGEN TEST

A dissolved oxygen (DO) test can be conducted on the aeration chamber contents to confirm overaeration or underaeration. The DO test can be performed on site using a properly calibrated portable DO meter with probe. The DO level can also be accurately determined through the use of an inexpensive colormetric test performed on a properly filtered sample from the aeration chamber. DO in the aeration chamber typically ranges from 0.5 mg/L to 9.5 mg/L and fluctuates according to cycle time and other factors including temperature and solids level. Comparison samples must be taken at the same point during the aerator run cycle because DO levels will vary according to cycle time. DO levels in the aeration chamber must be greater than 2.0 mg/L at the end of the aerator run cycle to accomplish nitrification and less than 0.5 mg/L at the end of the aerator off cycle to accomplish denitrification. A properly balanced system will have more than sufficient air during the run cycle to allow nitrification to take place and will deplete DO during the off cycle sufficiently to allow partial or complete denitrification.

Some areas have specific DO requirements for effluent returned to the environment and the same tests can be conducted on final effluent samples. The treatment processes of the Singulair system will cause effluent DO to differ from aeration chamber DO levels. Typical effluent DO will range from 1.0 mg/L to 6.0 mg/L depending on location, temperature and time of year.

HYDRAULIC OVERLOADING

Hydraulic overloading of the Singulair system is an indication that too much liquid is coming into the plant. This situation can adversely affect biological treatment and should be corrected immediately. Leak testing should be performed on toilets, faucets and other fixtures that discharge into the domestic wastewater plumbing to be sure that they shut off completely when not in use. Confirm that roofing down spouts, sump pump piping and other improper connections are not discharging into the Singulair system. Crushed or leaking influent sewer lines can cause groundwater to enter the system and should be thoroughly checked by a qualified contractor.

ORGANIC OVERLOADING

The Singulair system is designed to handle typical domestic waste. Occasionally, a specific application may result in excessive organic loading to the system. If you encounter an organic overload, the aerator run cycle can be adjusted in five minute increments up to continuous run. Instruct the owner regarding proper use of the system as described in the Singulair Owner's Manual.

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SERVICE PRO®

CONTROL CENTER WITH MCD TECHNOLOGY

TIME CLOCK SETTING AND SERVICE INSTRUCTIONS (Cont.)

HIGH ALTITUDE INSTALLATIONS

The Singulair aerator delivers more than 150% of the air required by nationally recognized wastewater treatment design standards. This abundant supply of air allows the Singulair system to be installed at high elevations without special consideration. At an elevation of 6,500 feet above sea level, the available oxygen is approximately 23% less than at sea level. In high altitude installations, adjustment to the aerator run cycle should be made based on the same evaluation procedures used for all Singulair systems.

INTERMITTENT USAGE

When the Singulair system is to be used intermittently (one day per week or a few days per month), the aerator run cycle should be adjusted to the minimum setting. When low usage or non-use periods are expected, precautions should be taken to insure the protection of system components. If an extended period of non-use (four months) is anticipated, the distributor should suggest complete system shut down and removal of components. This may only be done with the full knowledge and approval of the local regulatory agency. The final decision to shut down the system rests with the owner. The decision should be based on the same criteria as other seasonal or non-occupancy arrangements, such as care of hot water tanks, water pipes, refrigerators or freezers. The owner should arrange for the local distributor to remove and store the aerator and chemical feed tube(s) after vacancy. The service technician should place the control center selector switch in the "off" position. Arrangements must be made for the distributor to re-install Singulair system components before the site is to be re-occupied. Normal installation procedures, as outlined in the Singulair Service Manual, should be followed by the distributor when re-starting a system.

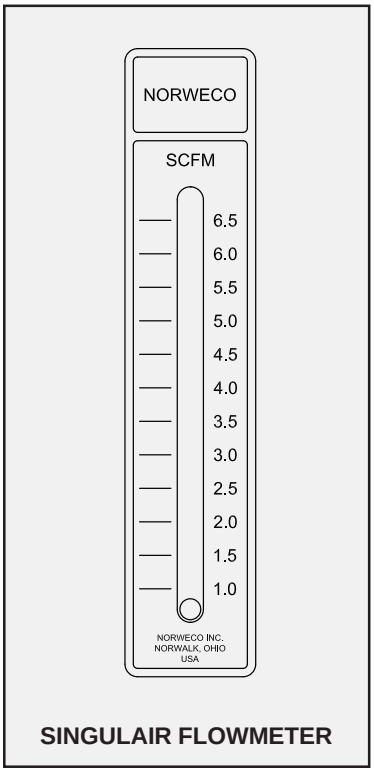
COMPLIANCE WITH REGULATIONS

Local regulatory officials must be informed whenever a time cycle adjustment is made. Regulatory agencies should participate in the adjustment decision and standard procedures should include consultation with regulators before any adjustment is made. Norweco distributors and service personnel should attempt to build and maintain a close relationship with regulatory officials. Consulting with regulators and owners before adjusting a Singulair time clock should strengthen communication and keep all parties properly informed. In instances where a close working relationship already exists with local regulatory officials, regulators may allow service personnel to submit notification after an adjustment has been made. Such a practice should only occur when a strong relationship exists between distributor and regulator and with the full knowledge and approval of the regulatory agency.

PRIOR TO SYSTEM ADJUSTMENT

The Service Pro control center is designed and manufactured to provide an aerator run cycle of at least 30 minutes per hour. The aerator run cycle can be adjusted, but in no case can the aerator operate less than 30 minutes per hour.

Use the Singulair flowmeter to determine that the proper amount of air is being introduced into the system. If the flowmeter confirms that the Singulair aerator is infusing the proper amount of air, proceed with the Settleable Solids test. Should the Settleable Solids or Dissolved Oxygen tests indicate that a time cycle increase is desirable, turn the Service Pro control center time clock dial to the "continuous" position. Allow the system to operate on "continuous" run for a few weeks until the service technician is available to check the system and speak with the owner. If the system has not returned to normal operation, the system is experiencing a problem other than with the time cycle and alternatives must be investigated. Refer to the "Hydraulic Overloading" and "Organic Overloading" sections of these instructions.



SINGULAIR FLOWMETER

If the change to "continuous" run has solved the operational problem, the time clock should be adjusted to bring the system into biological balance. When the service technician returns to the site, and operation has returned to normal, the technician should adjust the time clock to reflect the deviation in loading from the original time clock setting. Adjust the aerator run cycle to half way between "continuous" run and the original time clock setting (e.g. if the original setting was 30 minutes, adjust the time cycle to 45 minutes out of each hour). Instruct the owner to monitor the system and notify you of any problems. After at least one month, when a service technician is available and in the geographic area, check the system again. Additional adjustments may be necessary to completely balance the system.

TIME CLOCK SETTING AND SERVICE INSTRUCTIONS (Cont.)

TIME CLOCK ADJUSTMENT

NOTE: Use a small blade screwdriver to rotate the time clock dial to the desired position. Do not use excessive force when turning the time clock dial.

Singulair systems with more than one aerator must have all control centers set for the aerators to operate on identical run cycles. Follow these steps to adjust the time clock:

1. Open the control center enclosure and place the selector switch in the “off” position.

2. Rotate the time clock dial clockwise until the arrow molded into in the dial is aligned with the desired run time setting.

3. Place the selector switch in the “on” position.

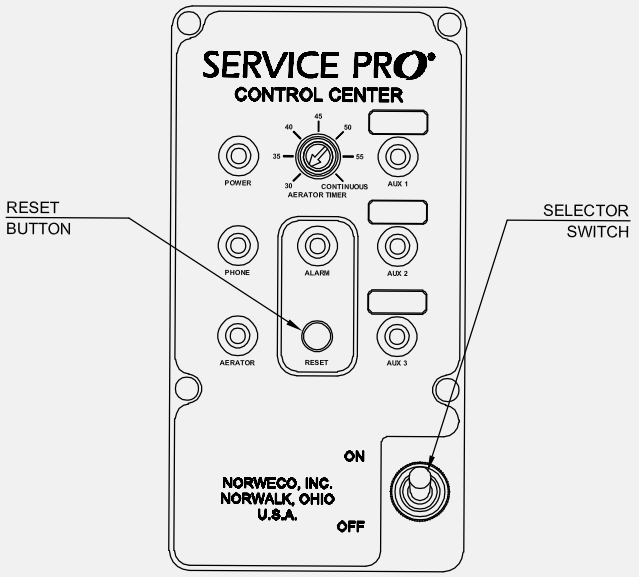
AERATOR RUN CYCLE

4. Close the control center cover and secure it with a tamper evident seal.

5. Record the new aerator run cycle on the Service Inspection Card.

SERVICE INSTRUCTIONS

The operation of the Service Pro control center can be verified on site through a series of tests. Before testing the Service Pro control center operation, insure the aerator is installed in the Singulair tank and the watertight electrical connector is plugged into the aerator power cord. To restart the aerator time clock cycle, place the selector switch in the control panel momentarily in the “off” position. Return the selector switch to the “on” position. The aerator should now be operating.



RESET BUTTON AND SELECTOR SWITCH

Allow the aerator to operate for 60 seconds before proceeding. If the aerator turns off or the alarms on the control center activate, an aerator over current condition has been detected or a problem has been detected in the Service Pro control center.

To test the aerator under current detection feature, simply unplug the watertight electrical connector from the aerator power cord. The visual alarm indicator on the control center should begin to flash within five seconds. Plug the electrical connector into the aerator power cord. The aerator should resume normal operation within five minutes and the visual alarm indicator on the control center will turn off.

To test the audible and visual alarms, hold the reset button in for five seconds. The alarms will activate for a five second period and then turn off.

Should the Service Pro control center require any service, replace the entire control center insert.

CAUTION: Be sure to shut off the Singulair circuit breaker in the main electrical service panel before any repairs are made. Confirm that the incoming electrical service reads zero volts before proceeding with control center insert replacement. Refer to Control Center Wiring and Installation Instructions for details on replacement of the control center insert.

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BIO-KINETIC® WASTEWATER TREATMENT SYSTEM

AERATOR TROUBLESHOOTING

AERATOR WILL NOT OPERATE

Electrical service to aerator interrupted	See “No Electrical Power from Control Center to Aerator”
Voltage supplied is insufficient to start aerator*	Report condition to power company
Defective bearing, windings or insulation in motor	Return entire aerator to factory
Debris wound on aspirator shaft	Remove debris with knife
Aspirator shaft bent	Return entire aerator to factory
Foam restrictor or entire aerator under water	See “Singulair System Flooded”

*If you suspect low voltage, check the voltage at the watertight electrical connector, not at the Service Pro control center. If voltage above 103 or more is measured, check the other possibilities listed in this section.

AERATOR DRAWING EXCESSIVE CURRENT

Foam restrictor partially under water	See “Singulair System Flooded”
Debris on aspirator shaft	Remove debris with knife
Motor failure	Return aerator to factory
Insufficient voltage (less than 103 volts)	Report condition to power company
Excessive voltage (greater than 126 volts)	Report condition to power company

AERATOR MAKING EXCESSIVE NOISE

Rubber shock absorbers on brackets worn	Replace shock absorbers
Bearing failure in aerator motor	Return aerator to factory
Noise is generated by excessive vibration	See “Aerator Operates With Excessive Vibration”

AERATOR OPERATES WITH EXCESSIVE VIBRATION

Debris on aspirator shaft	Remove debris with knife
Aspirator shaft bent	Return entire aerator to factory
Aerator mounting brackets bent	Straighten brackets
Top aerator brackets not seated evenly	Adjust mounting brackets
Aspirator shaft installed too tightly on intermediate shaft	Reinstall aspirator shaft with set screws finger tight only. If condition persists return entire aerator to factory.
Aspirator shaft installed with improper alignment to intermediate shaft	Reinstall aspirator shaft to factory alignment marks

AERATOR OPERATES BRIEFLY BEFORE CIRCUIT BREAKER TRIPS

Aerator is drawing excessive current	See “Aerator Drawing Excessive Current”
Aerator is partially under water	See “Singulair System Flooded”
Aspirator shaft bent	Return entire aerator to factory
Moisture has entered aerator motor	Return entire aerator to factory

AERATOR TROUBLESHOOTING (Cont.)

ELECTRICAL TROUBLESHOOTING

CAUTION: Before initiating any electrical component inspection or repair, turn off all power to the Singulair system by switching off the dedicated circuit breaker in the main electrical service panel and then testing with the electrical multi-meter. Repairs should always be made by a qualified electrician using proper procedures and safe tools. Make sure all circuits are properly grounded. Do not stand in damp locations when making electrical system tests. Always use tools with insulated handles for electrical repairs. Make sure all system access covers are in good condition and securely installed on the risers. Never allow access risers to be left uncovered or partially covered. Failure to secure access covers and safety nets could result in bodily injury, illness or death.

NO ELECTRICAL POWER FROM ELECTRICAL SERVICE PANEL TO CONTROL CENTER

Circuit breaker in electrical service panel has tripped	Turn breaker to “off” position, then turn “on”
Fuse in electrical service panel has blown	Have owner replace fuse
Circuit breaker in electrical service panel turned “off”	Turn breaker “on”
Loose connection in electrical service panel	Tighten all connections: First, shut off breaker in main electrical service panel
Defective circuit breaker in electrical service panel	Have owner replace circuit breaker
Corrosion on contacts prevents flow of current	Clean or replace contacts
Incomplete circuit - neutral not properly wired	Have owner wire directly to neutral bar
Power cable from service panel to Service Pro control center severed	Have owner locate break and repair

NO ELECTRICAL POWER FROM CONTROL CENTER TO AERATOR

Service Pro control center terminal A1 and neutral read zero voltage	Place selector switch in “on” position. If voltage is read, place selector switch in “automatic” position and rotate time clock knob until voltage is read. If no voltage can be read, replace control center insert.
Singulair circuit breaker has tripped	Push reset breaker
Singulair circuit breaker is defective	Replace breaker
Singulair selector switch turned “off”	Turn switch to “automatic” operation
Singulair selector switch defective	Replace control center insert
Corrosion on terminals prevents flow of current	Clean or replace contacts
Power cable from Service Pro control center to aerator damaged	Locate damage and repair
Loose wiring connection	Check all connections

AERATOR WILL NOT START

Reset breaker in Service Pro control center tripped	Push reset breaker
Loss of power to Service Pro control center	See both “No Electrical Power” sections
Insufficient voltage present at aerator	Report condition to power company
Watertight electrical connector not properly engaged	Remove watertight electrical connector and plug in tightly
Watertight electrical connector not properly wired	Rewire watertight electrical connector
Defective motor	Return entire aerator to factory

norweco® SINGULAIR®

BIO-KINETIC® WASTEWATER TREATMENT SYSTEM

TROUBLESHOOTING

During service inspections you may periodically encounter a situation which, if not identified and corrected, will result in interruption of service for the Singulair system. This troubleshooting guide is designed to enable you to isolate the cause of system problems that may be encountered from time to time. Whenever a potential problem is encountered, you should take immediate steps to eliminate the cause. Please note that all areas of installation, including those normally the responsibility of the contractor, excavator, electrician and owner, are covered. You will find that many problems can be traced to causes other than the system or its components. Your help and suggestions in solving these for the owner will save unnecessary expense and will insure maximum system performance.

PLEASE NOTE:

This troubleshooting guide provides efficient and correct solutions to most wastewater treatment problems when used in conjunction with established inspection procedures performed by a factory-trained service technician.

Before responding to a customer service call, check to see that:

- ✓ A member of your service staff, factory-trained and certified by Norweco, is dispatched to answer the call.
- ✓ Installation and service records for the particular system are up-to-date and have been reviewed.
- ✓ The service technician has a copy of the Singulair Service Manual.
- ✓ The service vehicle has loaner aerators, exchange aerators, Bio-Kinetic Service Cart, exchange Bio-Kinetic systems and a fully stocked Tool Kaddy with replacement parts.
- ✓ Clear and concise directions to the installation, including tank and control center location, are given to the service technician.

OPERATIONAL TROUBLESHOOTING

MUD OR SILT IN SINGULAIR SYSTEM OR BIO-KINETIC SYSTEM*

Influent sewer line separated at a joint or fitting	Have contractor excavate and repair
Sewer line crushed	Have contractor excavate and replace
Defective seal around tank inlet or outlet	Excavate and reseal
Singulair tank structurally damaged	Excavate and patch or replace tank
Singulair casting joint improperly sealed	Excavate and seal with non-shrink grout

*Have Singulair system pumped to remove mud after repairs have been completed. Multiple pumping may be required to remove all mud from the Singulair system. See: Singulair Tank Pumping instructions.

TROUBLESHOOTING (Cont.)

SEPTIC ODOR IN SINGULAIR SYSTEM

Aerator turned off	Place control center selector switch in “automatic” position
Insufficient air delivery by aerator	Service aerator
Aspirator shaft plugged with deposits	Remove from aerator and flush with shaft cleaning hose
Aspirator orifices plugged with deposits	Remove deposits
Water softener backwash discharging into system	Have owner remove backwash line from system
Circuit breaker tripped	See “Control Center Warning Light Glows/Audible Alarm Sounding”
Improperly sealed pretreatment chamber access cover	Seal pretreatment access cover
Vent cap openings restrict fresh air entry	Clean vent cap openings
Incomplete treatment due to hydraulic overloading	See “Hydraulic Overloading”
Periodic septic odor for no reason	Have sanitary sewer vent checked

HYDRAULIC OVERLOADING OF SINGULAIR SYSTEM

Ground water entering system through tank joint	Excavate and seal with non-shrink grout
Ground water entering system through crack in side wall	Excavate and patch with non-shrink grout
Ground water entering system through defective seal at inlet or outlet line	Excavate and reseal piping as needed
Roofing down spouts, footer drains, sump pump piping or garage and basement floor drains tied into Singulair system influent line	Have contractor relocate improper connection downstream of Singulair system

ORGANIC OVERLOADING OF SINGULAIR SYSTEM

Aeration chamber settled solids test reads in excess of 75%	Evaluate pretreatment chamber - See Singulair Tank Pumping instructions
Aeration chamber solids appear black	Evaluate pretreatment chamber - See Singulair Tank Pumping instructions

FLOATING SOLIDS IN CLARIFICATION CHAMBER OR PLANT EFFLUENT

Excessive sludge on clarifier sidewalls	Scrape hopper side walls
Restriction of Bio-Static or sludge return port	Remove obstruction
Pretreatment chamber discharging excessive solids	Evaluate pretreatment chamber - See Singulair Tank Pumping instructions
Hydraulic overloading of system	See “Hydraulic Overloading”

CONTROL CENTER WARNING LIGHT GLOWS/AUDIBLE ALARM SOUNDING

Liquid in tank at level of foam restrictor	See “Singulair System Flooded”
Aerator drawing excessive current	See “Aerator Drawing Excessive Current”
Dead short in power line to aerator	Have owner call his electrician