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NAYADIC

WASTEWATER

TREATMENT SYSTEMS

MANUAL
FOR
OPERATION AND MAINTENANCE
AND
TROUBLESHOOTING GUIDE

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I. BASIC OPERATION AND MAINTENANCE REQUIREMENTS

The following is a description of the normal maintenance required to insure continuous satisfactory operation of the ***NAYADIC*** systems:

START UP:

Allow 6-8 weeks for sufficient numbers of bacteria to develop in the ***NAYADIC*** in order to provide proper treatment of the wastewater. During this period there may be some sudsing due to laundry wastes. *The sudsing can be decreased by reducing the number of loads done at one time and by using a low sudsing detergent.* In situations where excessive grey water is expected, it may be necessary to seed the ***NAYADIC*** with mixed liquor from another aerobic waste treatment plant. To prevent short-term hydraulic overloads, homeowners should be advised to spread out laundry during this period.

PUMPING EXCESS SOLIDS:

Due to normal accumulation of inorganic solids and dead bacterial cells it is necessary to pump out the excess solids periodically in order to maintain adequate aeration capacity. For a typical single family residence, the ***NAYADIC*** will require pumping at 2-4 year intervals. ***NAYADIC*** representatives should advise customers when the ***NAYADIC*** should be pumped. On heavily used systems or residences with garbage disposals, the provision of a trash trap will reduce pumping frequencies.

COMPRESSOR REPLACEMENT:

The normal life expectancy of the compressor is 3-5 years. For all new installations, there is a two-year warranty on the compressor. For replacement compressors, there is a one-year warranty period. Compressors can also be repaired and/or rebuilt.

ALARM:

The ***NAYADIC*** alarm system indicates both loss of air and high water conditions. To prevent unnecessary maintenance costs, the homeowner should contact the service representative as soon as the alarm is activated or unusual odors are noticed.

SERVICE CONTRACT:

The ***NAYADIC*** system requires periodic servicing to prevent major operational difficulties. With the purchase of each ***NAYADIC***, the owner receives a two-year service contract that provides warranty on all parts and service, including a minimum of two inspections of the unit each year. After the initial two years of operation, the homeowner is urged to maintain a service contract to insure regular inspection and service of the ***NAYADIC*** system.

REPLACEMENT PARTS/SERVICE:

Contact the factory for the name of the closest sales/service representative.

SUMMARY OF RESIDENTIAL MAINTENANCE REQUIREMENTS

Start up period.....6-8 weeks after sewage first enters unit

Pumping frequency.....2-4 years

Compressor replacement.....3-5 years

Routine inspection frequency.....every 6 months or as required by state/local regulatory authorities

NOTE: Due to differences in raw wastewater strength, increased user abuse and hydraulic surges, additional pre-treatment facilities and/or increased maintenance may be required on non-residential or commercial facilities. Please check with your ***NAYADIC*** representative.

II. EQUIPMENT AND MATERIAL ESSENTIAL FOR SERVICING THE NAYADIC SYSTEM

100' garden hose with spray nozzle

100' extension cord

1/4 hp submersible pump with outlet made of flex pipe.

Small utility pump with 1/2 - 5/8" garden hose (6') on inlet and outlet (Teal model IP 579E, Simer Minivac Model M40 or equal.)

Pliers - standard with insulated handles

Pliers - channellock

Caulking gun

Caulking, silicone

Hammer

Electrical tape

Wire nuts

Knife

Screwdriver

Replacement parts:
compressor

diffusers
compressor repair kit
pressure switches, high level float switch (alarm)
alarm

Wiping rags

Sample collection jars (quart size)

Volt ohm amp meter

Allen key for lid

III. PROCEDURES FOR ROUTINE INSPECTION AND MAINTENANCE

The ***NAYADIC*** system requires routine, periodic inspection and maintenance to insure continuous, trouble-free operation. At a minimum, the ***NAYADIC*** should be inspected every six (6) months, assuming it is serving a typical single family residence. More frequent inspections may be required if mandated by local or stated regulatory authorities; or, if the ***NAYADIC*** is used on a non-residential application.

During the routine inspections, the following items are checked:

COMPRESSOR

1. Check filters for cleanliness. Replace if the filters are dirty or clogged.
2. Check housing and air line fittings for signs of overheating.
3. Check for air leakage at fittings or in air supply line.
4. Check for excessive noise or vibration.
5. Check for moisture or mud accumulations which could indicate possible flooding or direct rainfall on compressor.
6. Check air flow (with gauge), especially if odors or septic conditions are observed. A minimum of 3.0 cfm should be provided on all models <u>except</u> the M2000A.
7. Check carbon vanes for excessive wear. Replace as needed (approx. 2-3 years).

ALARM

1. Check "test" button to insure proper operation.
2. Check alarm function by raising float in tank.
3. Check alarm function by disconnecting airline union in tank.

TREATMENT PLANT AERATION CHAMBER

1. Check for presence of septic odor.
2. Check for color of aeration chamber contents.
3. Check for excessive sudsing or foaming.

4. Check for excessive accumulation of grease balls and non-biodegradable material. Using a wire skimmer basket, remove such material and dispose of it in a proper manner.
5. Check air supply at aeration chamber, especially if odors or septic conditions exist. Air check can be performed by observing amount of turbulence; or, by using an air flow meter. If necessary, check diffuser for clogging.
6. Check aeration chamber solids (MLSS) by collecting a sample of aeration chamber contents while compressor is running. Observe rate of settling, volume of settled solids and clarity of supernatant.

CLARIFICATION CHAMBER

1. Check color and depth of scum layer.
2. Check color and clarity of effluent. An effluent check can be done by running water from a garden hose into the aeration (center) chamber.
3. Check level of effluent weir.

MISCELLANEOUS ITEMS TO BE CHECKED

1. Check access cover to insure that it is properly fastened.
2. Check all peripheral equipment such as chlorinators, dosing pumps, filters, etc.
3. Check effluent disposal system.
4. Check compressor housing if installed outside. The housing should be adequately fastened over the housing; be well ventilated and protect the compressor from direct rainfall.

LABORATORY OR FIELD TESTS

Normally, laboratory testing is not required for the routine operation and maintenance of the ***NAYADIC*** system. Occasionally testing may be necessary to identify the source of an operational problem or to satisfy the requirements of the state or local regulatory agency.

SAMPLE COLLECTION

The ***NAYADIC***, when properly sized and maintained, will produce an effluent exceeding the performance requirements of NSF Standard 40 (Class I) for aerobic treatment plants: 30 day average of <25 mg/l CBOD and <30 mg/l TSS.

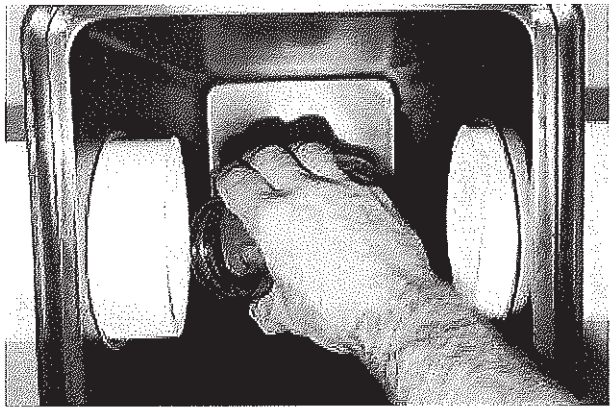
To collect sample from the ***NAYADIC***, care must be taken to get a reliable and uncontaminated sample of the **effluent that is being discharged from the plant at the time of the sampling.** To accomplish this, the following steps must be taken:

1. Provide a suitable sampling port on the outlet of the ***NAYADIC*** (see Fig. 1). The port should be at least 6" in diameter, with a minimum depth of 8" below the effluent line.
2. Using a clean cloth, wipe the interior of the effluent line where it enters the sampling port. This is to remove any debris that may have accumulated.
3. By opening a faucet or inserting a garden hose into the cleanout before the ***NAYADIC***, generate a flow through the plant. Allow the flow to continue for approximately one (1) minute in order to flush the line.
4. Shut off the water and dip the water out of the sampling port.

5. Turn on the water and collect a sample as the plant effluent flows into the sampling port. Do not collect water that has accumulated in the sampling port. Care needs to be taken to avoid catching dirt or other debris while collecting the sample.

Fig. 1

Treatment Plant Effluent →



→ To Disposal

IV. MAINTENANCE PROCEDURES: Pumping (wasting) sludge

Bacteria and other microorganisms present in the wastewater utilize the soluble organic material as a food source, converting it into a non-soluble mass. This non-soluble mass or floc is comprised of living microorganisms, sewage particles, as well as inert (non-biodegradable) material. As the process matures, the numbers of micro-organisms increase until there is an adequate biomass to metabolize or digest all of the soluble organic material in the incoming sewage. At this point, competition for food results in the dying (due to starvation) of organisms as new organisms are formed. These dying organisms, in turn are metabolized, thereby reducing the overall sludge volume.

The volume of solids will gradually increase due to the accumulation of the inert remains of dead organisms (ash), combined with the non-degradable material in the raw wastewater. As the solids increase, the mixed liquor (i.e., contents of the aeration chamber) becomes thicker, developing an increasing darker brown color. Periodically, the excess solids must be pumped (wasted) from the ***NAYADIC*** in order to insure continued plant efficiency.

PUMPING FREQUENCY

The rate at which the solids (biomass) accumulates in the ***NAYADIC***, and the subsequent rate at which the excess solids must be pumped out, is dependent upon the total volume and strength (i.e., BOD) of the wastewater entering the plant. The typical residential system will need to be pumped every 2-3 years. Commercial systems or systems that receive close to their design loading may need to be pumped every 1-2 years. Conversely, weekend cottages or systems serving only 1 or 2 people may go 4-5 years or longer.

DETERMINING PUMPING FREQUENCY

In order to insure optimum treatment efficiency and effluent quality, it is necessary to maintain the level of aeration solids (MLSS) within a suitable range (refer to Operational Control Chart). A low level of solids in the aeration chamber (i.e., during the plant start-up) reduces the

treatment plant's ability to provide adequate treatment during peak operating periods. Excessive solids, on the other hand, may result in poor settling during periods of hydraulic surges; or, in the development of septic conditions in the plant. In order to determine when the ***NAYADIC*** system should be pumped it is necessary to perform a settleable solids test (30-minute) during each semi-annual service check:

Procedure:

1. Mark a quart jar into 10 equal portions.
2. While the compressor is running, fill the jar with the liquid (MLSS) from the aeration chamber. This sample should be collected at mid-depth in the tank. **Do not collect a sample from within the draft tube**.
3. Allow the sample to sit for 30 minutes. If the sample settles slowly, allow it to sit for 24 hours in order to insure complete settling.
4. Measure the volume of the settled sludge as a percentage of the total volume of the sample. Occasionally, after the sample sits, a portion of the settled sludge may float to the top of the sample. If this occurs, add together the volume of settled sludge and the volume of floating sludge.
5. Compare the percent of settled sludge (i.e., sludge volume) to the figures given in the "Operational Control Chart". The optimum level of settleable solids is normally between 5-50%. Whenever the sludge volume exceeds 50%, the plant should be pumped.

PROCEDURE FOR PUMPING THE NAYADIC

1. Remove 30" access cover.
2. Carefully lower the pumper hose into the inner (aeration) chamber. Slide the hose down the wall of the inner tank until it rests on the bottom of the outer tank (clarifier). **Do not insert the hose down the draft tube unless the airline and diffuser are removed.**
3. Pump solids from the bottom of the outer tank. This will lower the liquid level in both the inner tank and outer tank simultaneously.
4. As the liquid level drops, the scum layer between the inner tank and scum baffle will normally break loose and drop to the bottom of the tank where it can be pumped out. With a garden hose, flush any remaining scum or residue to the bottom of the tank. **If the scum layer is more than 2" thick, it should be removed first.**
5. **In areas with a high-water table, immediately re-fill the tank with clear water to prevent shifting or floatation.**

SLUDGE CHARACTERISTICS

It is important to observe the MLSS (mixed liquor suspended solids) sample that is collected from the aeration chamber. As the sample settles you should note the following:

1. What is the color of the sludge?
2. Do the sludge particles clump together in a dense floc, which settles rapidly?
3. Is the liquid above the settled sludge (supernatant) clear?
4. Does the sample have a noticeable odor?

A good healthy sludge should have a chocolate brown color. It should form a dense floc that settles rapidly leaving a clear, odorless supernatant. A sludge sample that has a grey/black color, settles slowly, has a cloudy supernatant, or has a supernatant containing very fine, suspended particles, usually indicates poor treatment plant operation. Therefore, it is important

to compare your observations of the ***NAYADIC*** plant, as well as the sample of mixed liquor suspended solids to the conditions described on the "Operational Control Chart" to determine if the plant is operating properly or if any corrective action needs to be taken.

NAYADIC WASTE TREATMENT SYSTEMS MAINTENANCE PROCEDURES: Component Replacement

V. COMPRESSOR REPLACEMENT

Procedure:

1. Disconnect power before working on compressor.
2. Remove the compressor housing if located outside.
3. Disconnect the airline from the compressor air discharge fitting.
4. Disconnect the compressor's power cord from the electrical service line that goes to the alarm.
5. Remove the compressor.
6. Take the new compressor out of its packing carton. Remove the plywood shipping base and assemble the base plate (foot support) in accordance with the enclosed directions. NOTE: Keep the box and shipping base to return compressor for warranty.
7. Transfer the air discharge fittings from the original compressor to the replacement unit.
8. Remove plug from the air intake opening and screw in air filter (supplied with compressor).
9. Set the new compressor in place and re-connect the airline and electrical power cord.
10. Replace the housing, if applicable.
11. Re-connect the power and check for proper operation (refer to Section 5.0)

VI. ALARM REPLACEMENT

Procedure:

1. Disconnect power before working on alarm.
2. Unscrew the faceplate of the alarm.
3. Remove the wire nuts and disconnect the following wires:
   a) black and white to float and pressure switch
   b) black, white and green to compressor
4. Remove the alarm faceplate and replace with a new alarm.
5. Reconnect the wires described in item 3.
6. Replace the faceplate and restore power to the alarm.
7. Check alarm by pressing test button and by raising float in the NAYADIC plant.

VII. PRESSURE SWITCH REPLACEMENT

Procedure:

1. Remove the housing from the compressor (if applicable).
2. Disconnect the two sensor wires from the old pressure switch.
3. Unscrew the pressure switch from the airline and replace with a new one.
4. Re-attach the two sensor wires.
5. Check alarm by shutting off the compressor.

6. Replace housing.

VIII. DIFFUSER REPLACEMENT

Procedure:

1. Remove the access lid on ***NAYADIC***.
2. Using a garden hose, wash down the interior surfaces of the center (aeration) tank and airline, including the union on the top of the airline.
3. Unscrew the union and remove the lower portion of the air supply line (with diffuser).
4. Unscrew the diffuser from the end of the airline and replace with a new one.
5. Re-install the airline being careful to insert the airline and diffuser into the draft tube.
6. Tighten union and check to insure that there is adequate turbulence in the tank.
7. Replace the access lid.

IX. FLOAT REPLACEMENT

Procedure:

1. Remove the access lid on ***NAYADIC***.
2. Using a garden hose wash down the interior surfaces of the center (aeration) tank, airline, float, cord and cable connectors.
3. Remove the wire nuts on the float cord and disconnect the two wires.
4. Loosen the clamp on the airline and remove the old float.
5. Replace with a new float, making sure that the float is set at the same distance from the clamp and that the clamp is fastened securely to the topside of the airline and away from the inlet pipe.
6. Reconnect the two wires of the float making sure to use approved water resistant wire nuts.
7. Check the alarm by raising the float.
8. Re-secure the access lid.