



COMMERCIAL PLANT

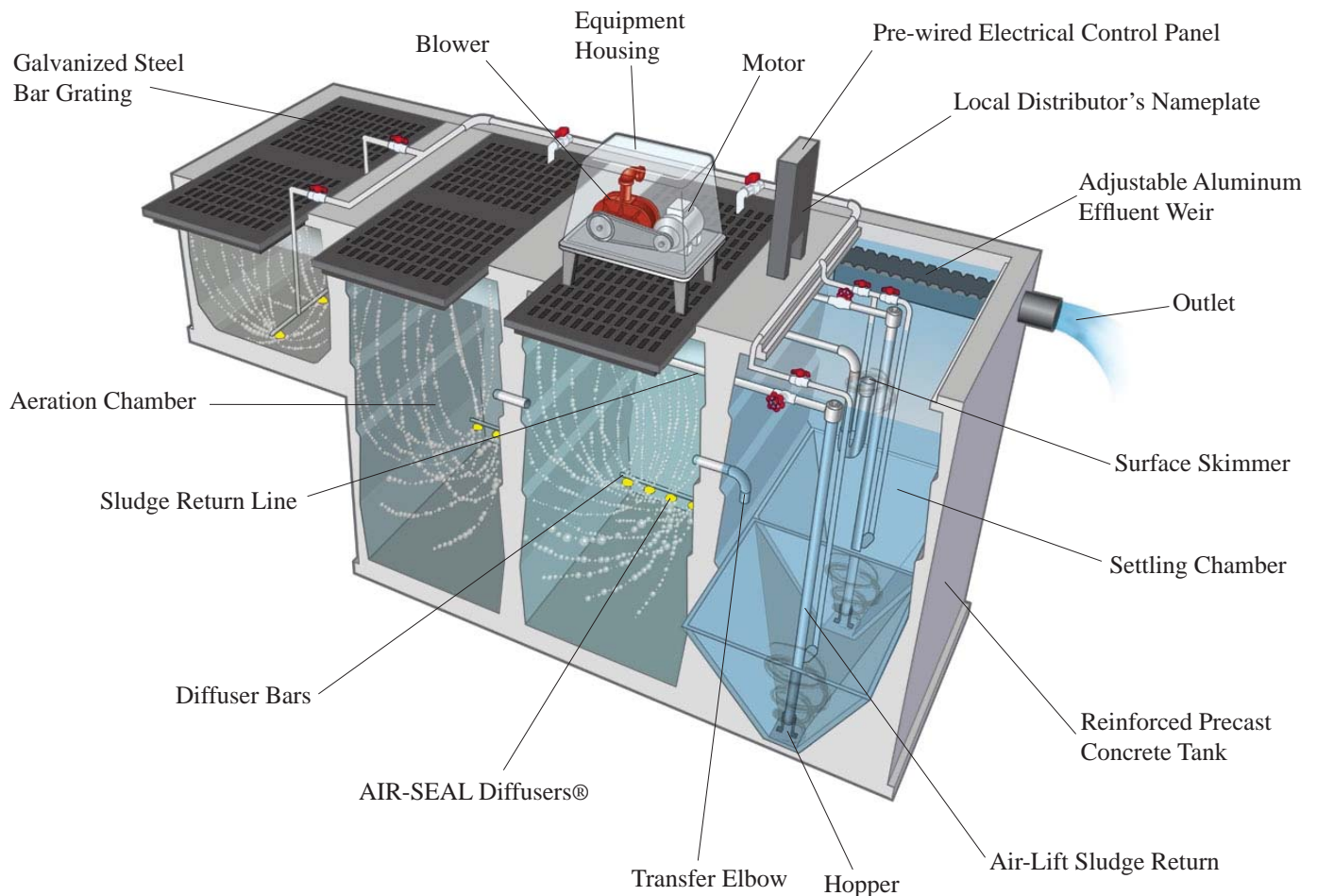
OPERATOR'S MANUAL

FOREWORD

Detailed operating and maintenance procedures for Jet Commercial Wastewater Treatment Plants are given in this manual.

Since Jet has pioneered many advances in wastewater treatment devices and techniques in recent years, and since many of these advances are explained in this manual, seasoned operators as well as new ones should study these instructions closely and use them as a guide for operating and maintaining their Jet Plants. Jet products deliver quality, plus your established local licensed distributor has been trained in the installation, operation and maintenance of Jet Plants. Jet quality and a conscientious operator who understands the material contained in this manual provide an unbeatable pollution-control team.

CUTAWAY OF TYPICAL JET COMMERCIAL PLANT



THE TREATMENT PROCESS

Jet Wastewater Treatment Plants employ a biological process known as "extended aeration" or "aerobic digestion." In this process incoming wastewater enters an aeration tank where the contents are thoroughly mixed and aerated by large volumes of air which are pumped into the tank under pressure. As the air bubbles to the surface, it transfers oxygen to the tank liquids. Aerobic bacteria present in the activated sludge in the tank use this oxygen to convert the wastewater to inoffensive, clear, odorless liquids and gases. Sometimes this process is referred to as "wet burning" because the bacteria actually destroy the wastewater by using oxygen, just as fire uses oxygen to burn trash. After the treated liquid leaves Jet's Aeration Tank, it is held in a "settling" tank, which is completely still. Here any partially treated particles settle to the tank bottom and are returned to the aeration tank for further treatment. This settling produces a clear, highly treated liquid which is ready for final discharge.

Virtually all authorities agree that, except for municipal plants, extended aeration is the most efficient, complete method of wastewater treatment available today. Many refinements and options can be used with extended aeration plants - especially with the larger ones. However, the basic process used in all extended aeration plants is as described here.

EXTENDED AERATION PLANTS

Basically, extended aeration plants can be divided into four main elements. These elements are:

1. Pre-Treatment
2. Aeration
3. Settling
4. Optional Equipment

PRE-TREATMENT

In this first stage, a pre-treatment device is used to physically break down the wastewater and trap untreatable material such as plastic or metal before it can enter the plant. The three basic types of pre-treatment devices are bar screens, comminutors, and trash traps.

Bar screens are used to trap large objects and prevent them from entering the plant.

A comminutor is a wastewater grinder designed to grind or shred large solids into smaller pieces. Comminutors should have a bar screen by-pass for additional protection.

The third type of device is a pre-treatment tank or trash trap. Here untreatable material is settled out and organic solids are pre-treated and broken down both physically and bio-chemically before being passed on to the aeration tank.

AERATION

In the aeration tank, "aerobic digestion" or "wet burning" takes place. Here the pre-treated incoming wastewater is mixed and aerated by air diffusers, located in the bottom of the tank. These diffusers inject ample air to meet the oxygen demand of the aerobic digestion process as well as mix the entire tank contents.

SETTLING

The next step in the process takes place in the settling compartment. Here there is no circulation so any remaining solids can settle to the tank bottom and be returned to the aeration chamber by the sludge return.

OPTIONAL EQUIPMENT

JET-CHLOR® TABLETS AND FEEDERS

The JET-CHLOR® Wastewater Disinfection System is a complete non-mechanical, gravity operated chlorine dispensing system, consisting of a JET-CHLOR® Tablet Feeder and JET-CHLOR® Tablets. Two commercial models are available for chlorination of flows up to 100,000 gallons per day.

JET-CHLOR® Tablets are formulated from pure calcium hypochlorite and contain a minimum of 85% available chlorine. JET-CHLOR® Tablets are registered with USEPA. Registration No. 45983-1. JET-CHLOR® Tablets are available from your Jet Dealer in 10, 25 and 45 pound pails or 100 pound drums. Write Jet Inc. for the name of your local dealer.

See "JET-CHLOR® Wastewater Disinfectant Systems" brochure for complete information and specifications.

HYPOCHLORINATION AND GAS CHLORINATION

The Jet Hypochlorination System is a complete compact chlorination station designed to add liquid chlorine to treatment plant effluent. Sodium hypochlorite should be used with this chlorinator. Chlorine can also be added as a gas. It comes in cylinders which also feed into a contact chamber. See "Jet Hypochlorinator Operator's Manual" and "Fischer & Porter Specifications" for complete information and specifications.

CHLOR-AWAY® TABLETS AND TABLET FEEDERS

The CHLOR-AWAY® Dechlorination System uses a compact, lightweight Jet Tablet Feeder and long-lasting sodium sulfite tablets to remove chlorine in proportion to the flow of treated wastewater. Two commercial models are available for dechlorination of flows up to 100,000 gallons per day. CHLOR-AWAY® can dechlorinate gas, liquid or tablet chlorinated wastewater. CHLOR-AWAY® tablets contain 85-90% active sodium sulfite. It is the most practical chlorine removal system available today.

"JET SPRAY" FOAM CONTROL SYSTEM

Foam develops in many plants because of the mixing action and the large amounts of air being diffused into the aeration tank. During plant start-up, foam exists in almost all plants, but once activated sludge develops, this foaming normally subsides. On installations where organic loading is high or where a lot of detergents are used, such as restaurants or laundromats, foaming may be constant. In these cases, a spray system should be installed.

Basically, Jet's Foam Control System consists of a pump, piping, and spray nozzles. The pump transfers the clear liquid from the settling compartment to the spray nozzles, arranged above the surface of the aeration chamber. A fine spray produced by the nozzles knocks down the foam and prevents its build-up.

All Jet Spray Systems are also equipped with a wash-water outlet which is convenient for cleaning and maintaining the plant.

SURFACE SKIMMER

Surface skimmers are used to remove any floating particles or material from the surface of the final settling tank. After it is removed, the material is returned to the aeration chamber for further treatment.

Skimmers are usually made up of an intake pipe and an air lift, which is an air-powered pumping device. The intake pipe is installed flush with the surface to draw in any floating particles and the air lift is used to pump these particles back to the aeration chamber.

Surface skimmers should be used wherever grease will be encountered. They are also extremely helpful maintenance tools because they eliminate the need for manually cleaning the settling tank surface. Most authorities feel they should be installed wherever possible.

TIME CLOCKS

The 3000 Series Jet Wastewater Treatment Plants are equipped with a 24-hour time clock that controls the plant's "on" and "off" cycles throughout the day. These time clocks permit a great variety of time cycles to be programmed during any 24-hour period, but once the program is chosen it remains the same for every day in the week. This is satisfactory for most loadings. The 24-hour time clock is available as an option on the 2000 Series plants. Certain installations such as schools, swimming pools, or churches have great fluctuations in flow and require longer treatment periods on some days than on others. For these installations, a seven day time clock can be installed to permit different time cycles for different days of the week.

STAND-BY EQUIPMENT (Optional)

Duplicate mechanical components for stand-by operation are sometimes required. The 3000 Series Jet Plants are designed so that these duplicate mechanical components alternate operation, allowing no single set of components to sit idle for long. This special alternation keeps the "stand-by" equipment in as fine a running order as the other set of components and eliminates "freezing" and other problems that always seem to plague mechanical equipment that is not used for long periods of time. This additional Jet feature is also available as an option on the 2000 Series Jet Plants.

SLUDGE-HOLDING TANK

Some authorities feel that certain types of installations sometimes produce excess activated sludge. In these cases they may recommend that a sludge-holding tank be installed.

Sludge is pumped into the holding tank through auxiliary piping which is connected to the plant's sludge-return pump. The sludge is held here until it is hauled away or else it is returned to the plant for final treatment. Holding tanks equipped with Jet AIR SEAL Diffusers® are called aerated sludge-holding tanks and are the most common type. Aerating a sludge-holding tank provides some treatment and eliminates the possibility of odor. All Jet sludge-holding tanks have overflows that lead back into the treatment plant.

FLOW METERS

Flow meters or flow measuring weirs are optional devices used on plants where it is necessary to accurately determine plant flows.

PLANT START-UP

Wastewater treatment plant start-up is simply balancing the plant's variable capacities, such as mixing, aeration, and running time, against the load of the facility it serves. Since no two plant loads are ever exactly alike, it is impossible at the time a plant is installed to pre-set it to do the best job it is capable of. At first, all you can do is analyze the load, choose the correct plant size, and make some initial equipment settings. From here on out it is a matter of observing the plant's performance closely for up to ten weeks, and making adjustments based on these observations. This "fine tuning" of a plant to its load is called plant "start-up." Plant start-up must be successfully completed before any plant will do the job it was intended to do. There is no question about the fact that all plants must receive regular start-up attention if they are to perform correctly. A conscientious start-up program will quickly bring a Jet Plant up to peak operating efficiency, but if there is no start-up program, or if it is drawn out or stopped, the plant will really never be efficient.

During start-up, the plant must be given daily attention by the owner or his representative, and it should be inspected frequently by the Jet Serviceman. Visits by the Jet Serviceman should be arranged in advance so he can get together with the owner's representative to answer his questions and give him instructions regarding maintenance.

Normally the start-up period for a Jet Plant will last approximately ten weeks. During this period, in which the activated sludge is developed, the aeration rate, sludge-return rate and running cycle are all balanced to meet the plant's loading.

ACTIVATED SLUDGE

The incoming wastewater contains dormant bacteria that are quickly stimulated to activity by the abundant supply of oxygen in Jet's Aeration Tank. These bacteria are able to quickly absorb and digest the organic material in wastewater and they are the primary element in activated sludge. Since the aeration tank provides an ideal environment for the bacteria, they multiply rapidly and are soon plentiful enough to oxidize or "burn up" all wastewater that enters the plant. Activated sludge draws the very fine suspended particles in solution to it, just as a magnet draws iron particles. Often this suspended material is so small that it would not normally settle out by gravity. But because of this magnetic characteristic, as the sludge settles to the bottom of the final compartment, it takes the fine suspended matter with it, just as if a filter were being passed down through the liquid. Naturally, this is a great improvement over ordinary gravity settling.

A great deal of the time taken in plant start-up is spent developing a good activated sludge culture. In some situations, such as the early opening of a restaurant, the owner may want to accelerate the start-up process. This can be done by "seeding" the plant which is accomplished by taking sludge from a plant already in operation and adding it to the new plant. Although seeding can speed up a start-up program, it should be remembered that even a "seeded" plant will deteriorate and not work properly if it does not receive the necessary start-up adjustments.

HOPPER MAINTENANCE

During its development, activated sludge is very stringy and tends to cling and build up on the slanted walls of the hopper. Therefore, during the first few weeks of plant operation, the hopper should be gently scraped each day with a squeegee. This scraping should move the sludge in a slow, gentle motion to the bottom of the hopper. Never stir or push the sludge quickly because it may then float to the surface, in which case it will have to be dipped out and put back into the aeration chamber. Floating solids also increase the solids level near the surface and reduce the quality of the effluent.

If sludge is allowed to build up in the hopper, eventually large chunks will break loose, sink to the bottom, and clog the sludge return. A clogged return will result in poor wastewater treatment because of the lack of sludge in the aeration tank, and in a very poor effluent because of the abnormally high solids in the final tank. Naturally, a major malfunction such as this prolongs the start-up period too. After the activated sludge is fully developed, it becomes less stringy and does not tend to build up on the hopper walls.

When this occurs, it will be possible to eliminate daily hopper scraping. However, this can only be determined by careful examination. Although the hopper eventually will not have to be scraped every day, it should never be left unattended for longer than a week.

AIR, MIXING AND CYCLE ADJUSTMENTS

Both the level of dissolved oxygen and the degree of mixing within Jet's Aeration Chamber are determined by the amount of air being diffused. For this reason, adjusting the aeration rate is the principal technique in plant start-up.

Minor air adjustments to provide even mixing can be made by regulating the individual valves for each diffuser bar assembly. Larger air adjustments, to alter the aeration rate, require the use of a time clock. The time clock is supplied as standard equipment on all 3000 Series plants and is available as an option on all 2000 Series plants. These time clocks regulate the air supply by controlling the "on" and "off" cycles of the blower. Time clocks are factory set to operate fifteen minutes out of every half hour and, although they can run longer or on other settings, they should never be set to operate less than 50% of the time.

The individual air valves should be used to regulate the air flow to provide even mixing. Even mixing simply means that the air should move the tank contents so that they are rolling evenly all along the tank wall. The valves should never be "throttled down," however. If the aeration rate needs to be reduced or increased, it should be done primarily by regulating the time clocks. By using a time clock to regulate the aeration cycle rather than throttling down the valves, it is possible to maintain high mixing velocities in the aeration chamber and still control and maintain a desired level of dissolved oxygen.

Any increase or reduction in the time cycle should equal 10% of the total running time. After a change is made, the plant should always be permitted to run at least 48 hours before any further adjustment. If the adjustment has been sufficient, improvement should be evident in the plant effluent within 48 hours.

SLUDGE RETURN RATES

An important factor in the treatment process is the return of the settled, activated sludge from the settling tank to the aeration tank. Jet's Sludge-Return Assembly, located in the final settling tank, is operated with air from the blower. This air is injected into the sludge-return assembly near the bottom of the hopper, causing settled sludge to be drawn in and up the pipe, where it is discharged back into the aeration chamber. A small valve installed on the sludge-return air line is used to adjust the return rate. Jet's sludge-returns are capable of pumping in excess of the total daily plant flow but normally they are adjusted to pump considerably less.

Initially the sludge-return air line valve should be turned all the way open. It should be left open for the first week or until the plant begins building up solids. This can be determined by the appearance and odor of the mixed liquor. As solids start to develop, the contents of the aeration chamber should lose their gray color and appear light brown. They should also develop a somewhat "earthy" odor and, as they continue to build up, the color should change to a richer brown.

An excessive sludge-return rate will cause the plant to lose solids over the weir. This can be easily detected by observing the effluent. If the sludge return is pumping too fast, it does not give the sludge time to settle, and creates a flow through the final tank which stirs up the solids and causes them to be discharged from the plant. If this happens, the air valve should be turned down one quarter turn each day until the plant stops losing solids. On the other hand, the return should never be adjusted too low and this should be checked by seeing that the end of the sludge-return outlet is never less than 1/4 full.

Always reduce the sludge-return rate slowly and carefully, because reduced return rates increase the chance of clogging. If clogging occurs, it can be corrected by back-washing (described in "Plant Maintenance"), but before the correction it will have resulted in sharply lowered plant efficiency and a poorer quality effluent.

START-UP ADJUSTMENTS

Adjustments of a Jet Plant during the start-up period are based mainly on the appearance of the plant and its effluent, Rates of aeration and sludge return should be adjusted until the plant reaches a level of efficient operation. The check list given here contains the start-up information needed to make plant adjustments and give each plant the “fine tuning” it needs to operate at peak efficiency. Normally the start-up adjustments given here are all you will need. However, a more complete list of plant adjustments can be found on the “Routine Adjustment Check List” in the “Routine Plant Maintenance” section. This list should be consulted if a condition occurs that is not covered here.

START-UP CHECK LIST

Influent Color		Aeration Tank Color		Settling Tank Color		Color of Return Sludge		Odor	Condition	Adjustment
Gray		Chocolate Brown		Clear		Chocolate Brown		Earthy	Good Operation	None
Gray		Chocolate Brown		Clear		Chocolate Brown		Earthy	Excessive foaming	Install or operate spray system
Gray		Chocolate Brown		Murky		Light Brown		Musty	Solids in effluent	Reduce sludge return rate
Gray		Light Brown		Light Brown		Light Brown		Musty	Floating solids in settling compartment	Scrape hopper. Skim settling tank
Gray		Light Brown		Light Brown		-----		Slightly septic	No sludge return	Backwash sludge return. Scrape hopper
Gray		Red		Reddish		Light Brown		None	Over aeration	Reduce aeration
Gray		Black		Black		Black		Septic	Insufficient aeration	Increase aeration.

REMEMBER-

HOPPER: Scrape gently every day during start-up.

AIR SUPPLY VALVES: Adjust for maximum air and even mixing. Use valves to adjust mixing. Control aeration by timer adjustments, if so equipped.

TIME CLOCK ADJUSTMENTS: Increase or reduce aeration rate by adjusting time clock 10% of total running time. After an adjustment, allow 48 hours before further adjustment. Plant should never run less than 50% of the time.

SLUDGE-RETURN VALVE: Leave 100% open until plant starts developing solids. Adjust valve down 1/4 turn each day until desired return rate is reached.

ROUTINE PLANT MAINTENANCE

To continue operating at peak efficiency after start-up is completed, all wastewater treatment plants should receive daily maintenance. Performance of plants that are not cleaned and adjusted daily will always be poorer than plants that are well maintained. Daily maintenance may seem like a little extra work, but it is well worth it because a well cared for plant will provide better treatment results, will have fewer mechanical problems and will actually require less overall maintenance.

CHECK DIFFUSER BARS

All Jet Commercial Wastewater Treatment plants are equipped with Jet AIR-SEAL Diffusers®. Jet’s AIR-SEAL Diffuser® is uniquely designed to use a trapped bubble of air to isolate and protect the air opening and air pipes from contact with the wastewater - even during shut-off periods. Because of this patented advantage, Jet AIR-SEAL Diffusers® are truly non-clog and will normally not require cleaning. If something unforeseen should clog a diffuser or diffuser bar, the lack of air and agitation will be quite evident. In this case, remove the diffuser bar and correct the blockage.

Each separate diffuser bar has an air-control valve, which you should adjust to control the mixing and to insure a uniform roll of the tank contents. Uniform mixing and tank roll are absolutely necessary for efficient wastewater treatment, so adjust the air valves carefully to achieve this. Never use air valves to “throttle down” or turn off the plant since they are only there to adjust for even mixing and roll.

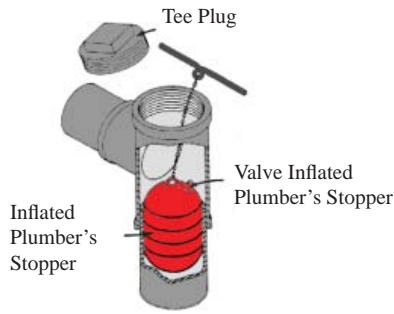


INSPECT SLUDGE RETURN

An air-lift sludge return, which uses air produced by the blower, pumps sludge from the settling chamber back into the aeration chamber. Jet sludge-return pumps are equipped with an air valve that you should use to adjust the return rate. Check the sludge-return rate by seeing that the end of the sludge-return outlet is never less than 1/4 full. This rate is the minimum required to keep the plant in balance and will reduce chances of the return plugging up. The return may be set to operate at any point above the 1/4 mark that works best for the plant.

Occasionally a sludge return will clog. Usually this is because the settling hopper has not been well maintained. When this happens, the quickest and easiest way to unplug it is to backwash it. Backwashing is a simple operation in which you shut off the sludge flow for a short time and force large volumes of air back through the sludge return to blow any clogged material out the intake end. To backwash a sludge return, turn the large liquid-sludge control valve, if so equipped, in the sludge-return line “off” and turn the small air valve to the full “open” position. This will force air back through the air lift and out the intake. In extreme cases when the normal volume of air is not enough, you may shut off other air valves in the system so a larger supply of air will be available for the backwash operation. To do this, simply shut off the valves for the individual diffuser bars, but be sure to note their settings before you change them so you can adjust them back to the original position.

The 2000 series plants and some of the smaller 3000 series plants do not have liquid sludge-control valves. However, the procedure for backwashing these plants is also quite easy. First, shut the sludge-return air valve “off” and remove the plug in the tee, located at the top of the air-lift pipe. Now inflate a “plumber’s stopper” below the tee and turn the air back on. The plumber’s stopper will close the line here, just like a valve, and the air will be forced back out the intake of the pump, clearing the blockage.



Backwash with stopper

CLEAN & ADJUST WEIR

During every plant maintenance inspection, you should check the weir to see that it is skimming evenly over its entire surface and clean it to keep it free of sludge build-up. Jet's Weirs are designed so they may be adjusted from side to side or end to end, and these adjustments may be made easily from above the surface. You can make large adjustments in the level of the weir by rotating the weir body back and forth in the outlet coupling. Finer ones can be made by moving the weir plates up or down. Because these plates can be adjusted from inside the weir, no tank pumping or special tools are required. These features are significant advantages since plants often settle enough after installation to put the weir out of adjustment.



SCRAPE HOPPER

To prevent sludge build-up, the slanted walls in the hopper should be scraped daily. Use the squeegee to gently move the sludge to the bottom of the hopper, where it will be picked up by the sludge-return pump. Be careful not to agitate the liquids in the settling chamber any more than necessary.

CLEAN FINAL SETTLING TANK SURFACE

If a plant has been equipped with a surface skimmer, it should be turned on daily, long enough to remove any particles floating on the settling tank surface. When a plant does not have a surface skimmer, you should dip any floating particles out of the settling chamber with a suitable tool, such as a piece of screen. After removal they can be placed back in the aeration tank or otherwise disposed of.

INSPECT AIR VALVES

You should check the plant air valves daily to be sure they are providing the correct mixing and sludge-return rates. They should be checked monthly to be sure they are not leaking.

To check for leaks, turn off all valves and observe the aeration chamber. There should be no bubbles rising to the surface. While the valves are "off", spray them with leak detector and watch for bubbles. Plastic squeeze bottles of leak detector are commercially available. Or, if you prefer, "paint" the valves with a solution of soapy water and watch for bubbles. Next, shut off the sludge-return air valve and check the outlet of the sludge return - it should not be pumping any liquid. Normally it will not be necessary to replace faulty valves since most leaks can be corrected by repacking the valve with grease or by installing a new rubber washer.

SHUT OFF POWER BEFORE CHECKING MECHANICAL OR ELECTRICAL COMPONENTS

Always shut the electrical power off before inspecting any mechanical or electrical equipment. Keep your hands and all objects away from the equipment until you have shut off the main circuit breaker on the control panel.

INSPECT V-BELT

Check the tension on the V-belt to be sure it is not slipping by turning the unit off, letting it come to a complete stop, and then turning it back on. If the belt is too loose, the pulley on the motor will turn several times before the blower pulley starts to turn. If this happens, shut off the main circuit breaker and tighten the belt, then check it again. Belts should be checked weekly because new ones stretch at first and all belts wear and loosen as they are used.

CHECK ELECTRICAL CONTROLS

You should check all time clocks once a week to be sure they are set for the correct time of day. All the disposable fuses for optional equipment should also be inspected weekly and replaced if necessary. Once a year, completely check over the electrical panel. Replace any worn or frayed leads and securely tighten all conduit fittings and connectors.



SERVICE PRE-TREATMENT DEVICE

If a comminutor or bar screen is installed, you should check and clean it daily. Follow the specific instructions for these devices given in their individual information sheets.

When a pre-treatment tank or "trash trap" is used, it requires a yearly inspection for blockages near the inlet and outlet. Pre-treatment tanks need not be pumped unless they have received a large quantity of untreatable material such as sand, rocks, metal, etc. They are designed to filter out untreatable materials as well as to break down and pre-treat wastewater before it enters the plant. They are not designed to prevent organic solids from passing through, as a septic tank is, and for this reason they do not have to be pumped as often as septic tanks.

SAMPLE EFFLUENT

You should inspect the plant effluent daily to insure that it is clear and odor-free. Weekly, the effluent should be given a relative stability test, which will indicate the level of treatment. Relative stability test kits are available from your Jet Distributor.

REPAINT

You should check, clean and spot-paint all metal surfaces, at least once a year. This is normally a very short job.

CLEAN-UP

The plant and surrounding area should be cleaned daily. When the plant is equipped with a wash-water outlet or if there is a water supply nearby, you should wash down the piping and inside sidewalls of the plant. Grass and weeds should be kept at least 3" away from the edge of the plant and the surrounding grade should always be maintained at least 3" below the tank top.

Once a month, you should lubricate all locks and hinges on the plant grating and equipment enclosures.

Always be sure to replace and lock all panels and grating sections before leaving.

OPTIONAL EQUIPMENT

Be sure to follow the maintenance instructions for optional equipment given in their individual information sheets.

Influent Color	Aeration Tank Color	Settling Tank Color	Color of Return Sludge	Odor	Condition	Adjustment
Gray	Chocolate Brown	Clear	Chocolate Brown	Earthy	Good Operation	None
Gray	Chocolate Brown	Clear	Chocolate Brown	Earthy	Excessive foaming	Install or operate spray system
Gray	Chocolate Brown	Clear	Chocolate Brown	Earthy	Floating lumps of grease in settling tank	Skim settling tank frequently. Clean or install grease trap
Gray	Chocolate Brown	Clear	Chocolate Brown	Musty	Layer of sludge visible near surface of settling tank	Increase sludge return rate. Scrape hopper
Gray	Chocolate Brown	Murky	Light Brown	Musty	Solids in effluent	Reduce sludge return rate
Gray	Light Brown	Light Brown	Light Brown	Slightly Musty	Floating solids in settling compartment	Scrape hopper. Skim settling tank
Gray	Light Brown	Light Brown	-----	Slightly septic	No sludge return	Backwash sludge return. Scrape hopper
Gray	Light Brown	Brown slime floating on surface	Light Brown	None	Plant under-loaded	Reduce running time
Gray	Light Brown	Black	Black	Slightly septic	Inadequate return of sludge	Increase sludge return rate.
Gray	Light Brown	Clear	Light Brown	Musty	Uneven tank oil	Adjust valves until roll (mixing) is uniform
Gray	Gray	Murky	Gray	None	Insufficient solids in plant	Increase aeration. Increase sludge return rate.
Gray	Red	Reddish	Light Brown	None	Over aeration	Reduce aeration
Gray	Black	Black	Black	Septic	Insufficient aeration	Increase aeration.
Gray	Black	Black	-----	Septic	No air rising in tank. Blower not running.	Press reset on starter. Check V-belt. Check circuit breaker. Check power.
Black	Black	Black	Black	Septic	Septic wastewater	Maximum aeration. Check incoming flow for toxic material such as bleach, gasoline, etc.

ROUTINE EQUIPMENT MAINTENANCE

Equipment in a wastewater treatment plant requires a certain degree of maintenance just as all other mechanical equipment does. Jet Plants have been designed to perform well with as little maintenance as possible. The service steps outlined here are not difficult but are absolutely necessary to insure proper plant operation and long equipment life.

Always shut off the electrical power before you inspect any of the mechanical or electrical equipment. Keep your hands and all objects away from the equipment until you have shut off the main circuit breaker on the control panel. Check the manufacturer's equipment manuals provided for additional information.

BLOWER

Positive displacement blowers are used to supply air to the treatment plant. These blowers contain two impellers, mounted on parallel shafts that rotate in opposite directions. As the impeller passes the blower housing inlet, it traps a small quantity of air between itself and the blower housing. It carries this air around to the outlet and discharges it.



Gears are installed on the end of each shaft to control the position of the impellers, with relation to each other, and thus maintain the clearances needed to assure maximum air flow efficiency, minimum wear, and long life. Since there is no contact between the impellers and the inside of the blower, internal lubrication is not needed and water sealing is not required. In fact, the blower is not able to handle liquids.

The blower gear housing should be checked weekly to be sure it is filled with SAE 40 lubricating oil. To do this, shut the blower off, remove the pipe plugs in the oil fill and oil level holes. Fill the housing through the oil fill hole until oil starts to run out the oil level hole. Then replace the plugs.

Bearings at the gear housing end of the blower are lubricated with oil splashed from the gears, but the bearings at the drive end need to be manually lubricated with grease every month. Use the grease gun and recommended grease listed in the Blower Operation Manual. Always remember to replace the yellow lubrication caps and square drain plugs when you are finished.

Whenever you plan to have the unit out of service longer than 72 hours, it should be flushed with a 50-50 mixture of 20 weight oil and kerosene. This can be done by removing the air filter and pouring the mixture into this hole. Replace the air filter immediately after pouring the mixture in and rotate the pulleys by hand for several turns before turning the unit on again.

MOTOR

Clean all dust away from the ventilating openings on the motor shell at least once every month.

The motor bearings should be re-lubricated every five years. To do this, remove the motor end bells and clean old grease from the bearings and end bells. They must be kept completely free of dirt! Repack the bearings with GE D6A2C5 grease or equivalent and fill the lubrication cavity one-third full of grease. **DO NOT** overdo it, excessive or too frequent lubrication may damage the motor. This grease may be obtained through any GE motor repair station.

Well-maintained motors normally do not require repair, but if a motor does fail or if you are not equipped to re-lubricate it, fast, dependable service for your motor or any other component can be obtained through your Jet Distributor.



PULLEYS & V-BELTS

Pulleys and V-belts are used to transfer power from the motor to the blower. The V-belts need to be kept just tight enough to prevent slipping. Never over-tighten a belt because this will considerably reduce its life. To insure maximum life from each belt, the pulleys must be kept in perfect alignment. They can be aligned by placing the flat side of a level against the front face of both pulleys, loosening the motor mounting bolts and rotating the back of the motor until both pulleys are flat against the level. If possible, it is an excellent idea to always keep an extra belt on hand as a spare.



PRESSURE RELIEF VALVE

Pressure-relief valves are installed on all blowers to prevent excessive pressures from building up when valves are closed or partially closed during plant operation or maintenance. These relief valves are simple in construction and require very little attention. They should, however, be kept clean and they should be checked monthly to be sure no dirt or rust has accumulated that would interfere with their free operation. To service them, simply remove the weights, take off the removable cap, clean all surfaces and apply a light coat of oil to the inside of the cap and the outside of the valve.



AIR FILTER OR INLET FILTER-SILENCER

Air inlet filters are installed on all blowers to reduce noise and clean incoming air. Air filters should be cleaned monthly and when possible, two filters should be alternated in use so that one can be operating while the other is being soaked and cleaned. The filter can be cleaned by blowing it dry with an air gun.

TIME CLOCK

A time clock is installed in each 3000 Series Jet Plant to control its operation. These clocks have trippers on a dial which permit variable "on-off" operation for any 15-minute period throughout the day. This clock is optional on the 2000 Series Plants.

7-day time clocks (optional) can also be provided. They have a patented skip-a-day feature that permits omission of any day or days of the week. This second clock permits two separate daily cycles, either of which may be used any day of the week.

Check the time clock trippers once a year to be sure they are either fully engaged or disengaged. If they are not fully engaged, they may turn the blower "on" during what should be an "off" period or vice versa. Also check the terminals of the clock once a year to make sure they have not loosened. Blower is "on" when clock trippers are pulled out and "off" when they are in.



ROUTINE MAINTENANCE CHECK LIST				
MAINTENANCE ITEM	DAILY	WEEKLY	MONTHLY	YEARLY
Go through routine adjustments	X			
Balance diffuser air flow (mixing)	X			
Check sludge-return rate	X			
Clean and check effluent weir	X			
Scrape hopper	X			
Clean surface of final tank	X			
Inspect air valves for leaks			X	
Inspect V-belt for tension and wear		X		
Check time-clock setting		X		
Check and replace worn electrical leads				X
Check pre-treatment tank for blockage				X
Sample effluent for odor and clarity	X			
Check relative stability of effluent		X		
Clean and repaint all metal surfaces				X
Clean up plant	X			
Replace and lock panels	X			
Replace blown optional fuses		X		
Check blower oil level		X		
Lubricate blower drive bearings			X	
Clean motor vents			X	
Clean pressure-relief valve			X	
Clean air filter			X	
Check time-clock terminals and trippers				X
Check pulley alignment			X	
Lubricate all locks and hinges			X	
Optional device:				

Important: Be sure to shut off electrical power before working with mechanical or electrical equipment

TROUBLE SHOOTING

One of the real advantages of Jet Plants is that if problems do occur they are relatively easy to correct. This list of possible problems, their causes and corrections covers virtually everything that could be encountered. If a condition should occur which is not covered here and which you cannot correct, call your local licensed Jet Distributor.

SURFACE SKIMMER NOT SKIMMING

Cause	Correction
Clogged intake pipe	Backwash skimmer
Clogged outlet pipe	Reverse backwash procedure
Intake too close/too far from surface	Adjust intake
Skimming Small area	Adjust intake or decrease pumping rate.

SOLIDS IN EFFLUENT

Cause	Correction
Clogged sludge return	Backwash air lift
Excessive sludge-return rate	Reduce return rate
Plant overloaded	Increase aeration or have plant influent analyzed
	Decrease plant running time
Over-aeration	

FOAM CONTROL NOT SPRAYING

Cause	Correction
Timer cycled "Off"	Turn time clock "On"
Clogged spray nozzles	Remove and clean nozzles
Clogged spray pump	Remove and clean pump
Blown fuses	Replace fuses
Lines clogged	Remove and clean lines

FLOATING SOLIDS

Cause	Correction
Excess grease	Clean grease trap
Clogged sludge return	Backwash air lift
Sludge build-up hopper	Scrape hopper or waste sludge
Over-aeration	Reduce plant running time

UNEVEN AERATION

Cause	Correction
Valves out of adjustment	Adjust valves on air header
Clogged air line	Remove and clean diffuser bar and drop pipe

SLUDGE RETURN NOT PUMPING

Cause	Correction
Clogged sludge return	Backwash sludge return
Insufficient air pressure	Open sludge air valve
Blower not running	See Blowers Manual

EXCESSIVE FOAMING

Cause	Correction
Plant start-up	Normal condition during start-up, continue operation
	Reduce running time
Over-aeration	Increase aeration or have plant influent analyzed
Excessive solids	Reduce running time
Lack of solids	



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