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OPERATING INSTRUCTIONS FOR THE DYNASAND® FILTER

1. FUNCTION OF THE DYNASAND® FILTER

The Parkson DynaSand Filter is a unique filtration system since it continuously filters liquid suspensions to excellent effluent quality while it continuously cleans the filter media.

The influent suspension is introduced into the filter through the feed nozzle. The flow enters a series of vertical tubes which protrude into the filter. These riser tubes, as shown in Figure 1, discharge beneath the inlet distribution hood which allows even distribution of the influent into the sand bed. The influent is filtered upward through the sand and the clean filtrate exits the unit over the filtrate weir at the top of the tank.

ARO model PD20A-AAP-GGG s/n E80S8207 120PSI

During the upward filtration of the influent, the sand continuously moves downward. The use of an internal airlift transports the dirty filter media to the top of the filter for cleaning.

2 1/2" in/out

A small supply of air is continuously introduced into the airlift chamber. This chamber is at the bottom of the airlift which is enclosed by a protective housing running vertically through the center of the filter. The filtered solids and sand are pulled into the airlift and conveyed to the top of the unit. The agitation and turbulence within the airlift cleanses the sand of the filter solids. These solids and sand exit the airlift into the central compartment/washer section. Within this section, the sand is further washed and the solids and sand are separated. The clean sand, having fallen through the washer, is distributed evenly over the sand bed. The washer/central compartment section is isolated from the filtrate except where the sand exits at the bottom of the washer. The blow up of the washer shows that a small amount of filtrate flows up through the sand washer assembly and acts as the reject water. The reject water traps all of the separated solids and this stream flows over the reject weir and out of the filter through the reject nozzle.

top platform

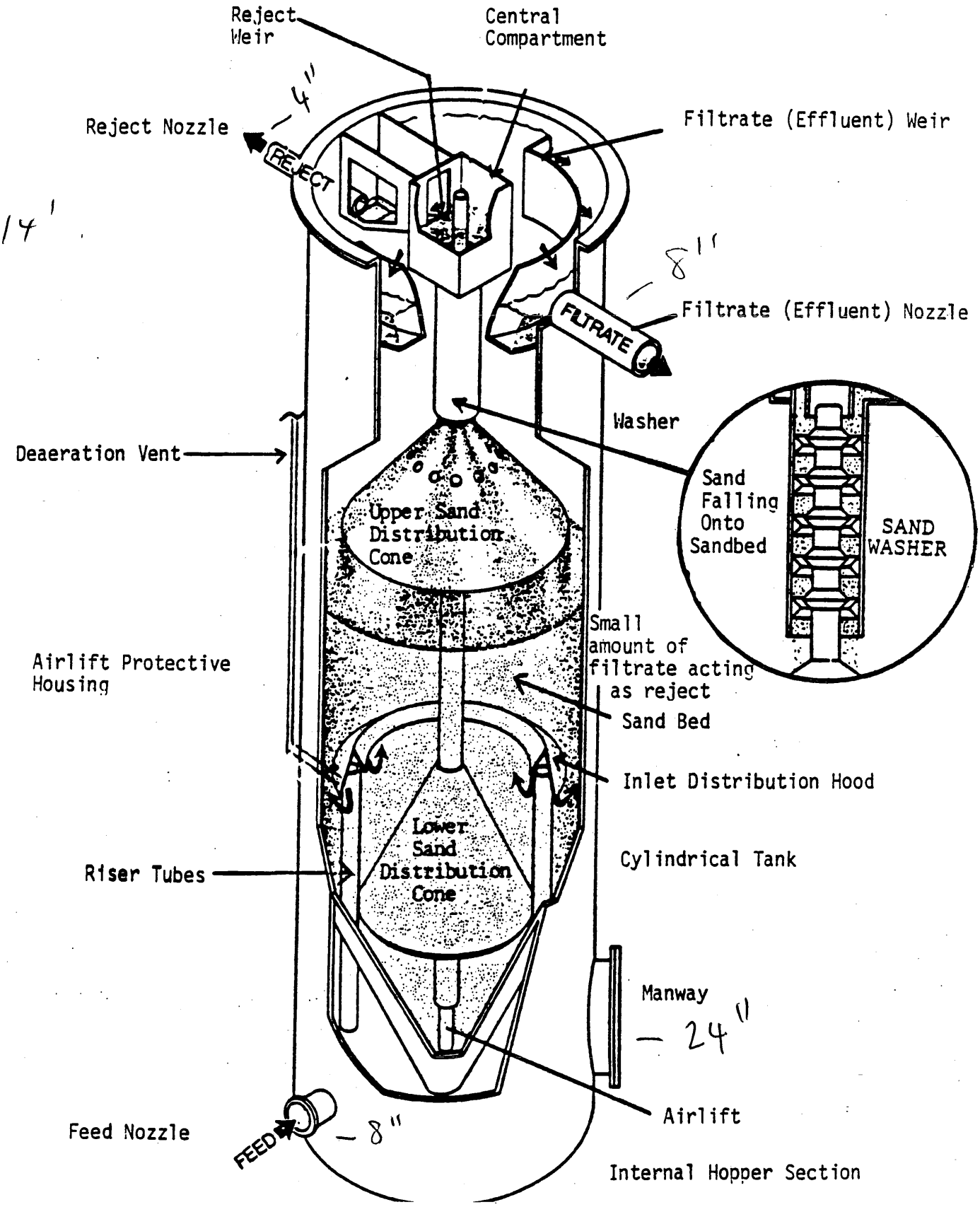
red

Please refer to Figure 1 for identification of the DynaSand Filter components. It will be necessary to identify these parts for proper installation and operation.

model 38 SF FRP
S/N DSF 1664

THE PARKSON DYNASAND® FILTER
CYLINDRICAL TANK UNIT

Figure 1



2. INSPECTION, INSTALLATION AND ASSEMBLY OF THE FILTER

Please refer to "Installation Instructions" and the DynaSand Filter drawing packet included within this manual. Also refer to Preliminary Instructions for Installation and Operation of a DynaSand Filter (DS-317). It is advisable to thoroughly go over these documents to ensure a proper installation.

Unit Check-Out

Before erecting the filter, the unit should be thoroughly checked out for any damages which may have occurred in shipment. Check for any damages to the tank or tank flanges. On carbon steel units, enter the filter and check that the internal components are securely in place.

Refer to the general arrangement drawing and Figures 1 and 2. If your unit is a cylindrical tank model, inspect the internal hopper section/cylindrical tank connection. The internal hopper should sit evenly and securely in the tank and it should be sealed at the outer edge where it connects with the cylindrical tank. The lower sand distribution cone should be seated evenly on tabs which are attached to the riser tubes. The airlift assembly is supported by a collar which sits on top of the lower sand distribution cone. The inlet distribution hood should be sitting evenly on top of the riser tubes and should be wired or bolted in place to the riser tubes.

Figure 2 also shows the deaeration vent line connections. Ensure these connections are secure.

If your unit contains an upper sand distribution cone, check to make sure it is in place. This cone is supported by a collar on the airlift assembly and bracing attached to the tank wall. Ensure that the washer and central compartment are securely in place. Please refer to the drawing entitled Sand Wash Housing and Central Compartment in your drawing package.

The central compartment/washer section is supported by angles across the top of the unit. Within the washer are a series of donut shaped wash rings and spacers. These rings should be evenly spaced and supported by "spider" rings which also align and center the airlift. Ensure that the wash rings and "spider" rings have not moved out of position. If the unit is FRP, make the above checks by looking into the top of the unit.

When setting the unit in place, please refer to the Installation instructions as care must be administered in doing such.

After righting and leveling the unit, check again to make sure the internals have remained in place. Ensure that no foreign objects have fallen into the unit.

Check that the "ship loose items" have arrived. See packing list and the list on the general arrangement drawing. The ship loose items include:

Instrument (Air Control) panel;

Headloss Scale;

Splash Hood;

Reject Weir Pieces:

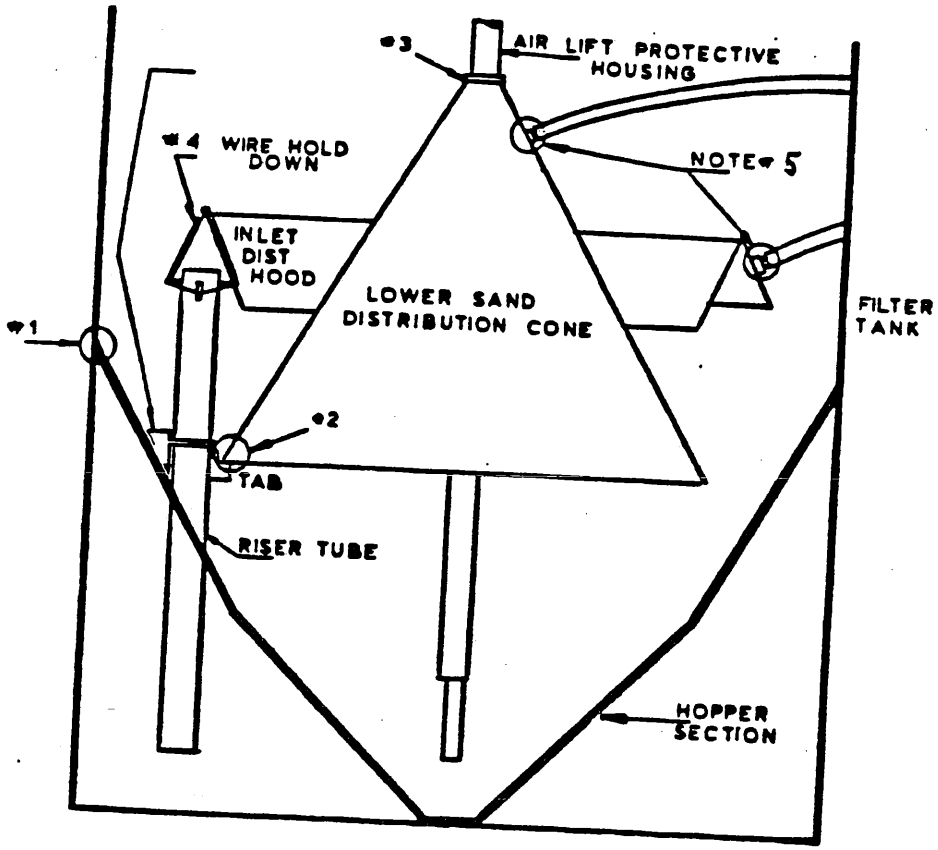
Airlift Lifting Handle (Except for DSF-64);

Valves and Fittings;

Hosing, etc.

Figure 2

INSPECTION OF DYNASAND® FILTER



NOTES:

1. On cylindrical tanks, ensure this joint is secure and sealed.
2. The cone should rest evenly on the riser tube tabs.
3. A stainless steel collar is welded to the airlift protective housing. It is then supported on lower distribution cone.
4. The inlet distribution hood is wired or bolted to the riser tube.
5. Ensure deaeration vents are securely coupled to inlet hood (and lower cone, if applicable).

Drawing is not to scale; some parts (riser tubes) omitted for clarify.

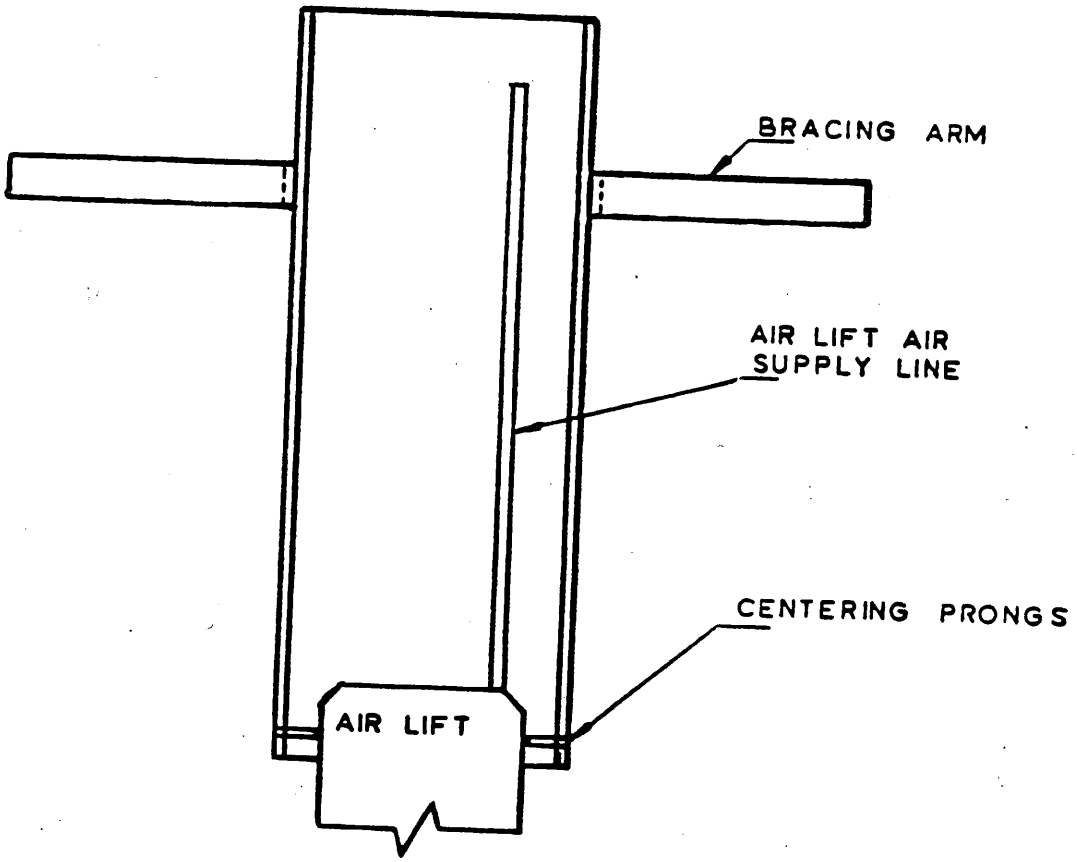
Splash Hood

The splash hood, which is shipped loose, is a short piece of pipe with a set of centering prongs on the interior of one end. See Figure 3. Attached to the exterior on the opposite end is a bracing arm. Place the splash hood over the airlift air supply line and the top of the airlift. Locate this movable bracing arm so the splash hood covers the airlift and the arms are supported by the central compartment.

The splash hood is placed over the airlift so the sand and solids which exit the airlift are directed into the washer section. If the splash hood is not in place, sand loss and poor performance will result.

Figure 3

SPLASH HOOD



Air Supply and Help Start

The filter will come with a compressed air control panel which is shipped loose. See drawing package; drawing entitled "instrument Panel" and refer to Page 4 of DS-317 for details. Attach the outlet of the air panel to the airlift air supply line on the filter through the top of the splash hood. The sand rate is a function of the compressed air rate. The compressed air rate is set by the flow control valve on the air flow meter and will remain the same as long as the valve setting is the same and the pressure upstream the valve is constant. To ensure constant pressure, a pressure control valve can be set on 30 psi and will then give a constant downstream pressure (as long as the upstream pressure is always higher than 30 psi).

The sand rate can be varied and can be increased to compensate for higher suspended solids concentrations in the feed. There is, however, a limit to the capacity of the sand washer separator. The air supply line is located at the top of the unit and protrudes from the top of the airlift assembly.

On some models (DSF-64), there may be two such lines. Attach the airline to the line which is longer. The other line is the "help start" connection. A water line may be attached to this connection. This connection is provided to assist in start-up of the unit. if help-start is not needed, cap this line to prevent sand from getting in it. Please see Page 17 for proper operation of the help start.

NOTE: When the air supply line is not attached, always seal this line with tape or hosing to exclude any foreign object. Check the air supply to ensure that air flows to the airlift.

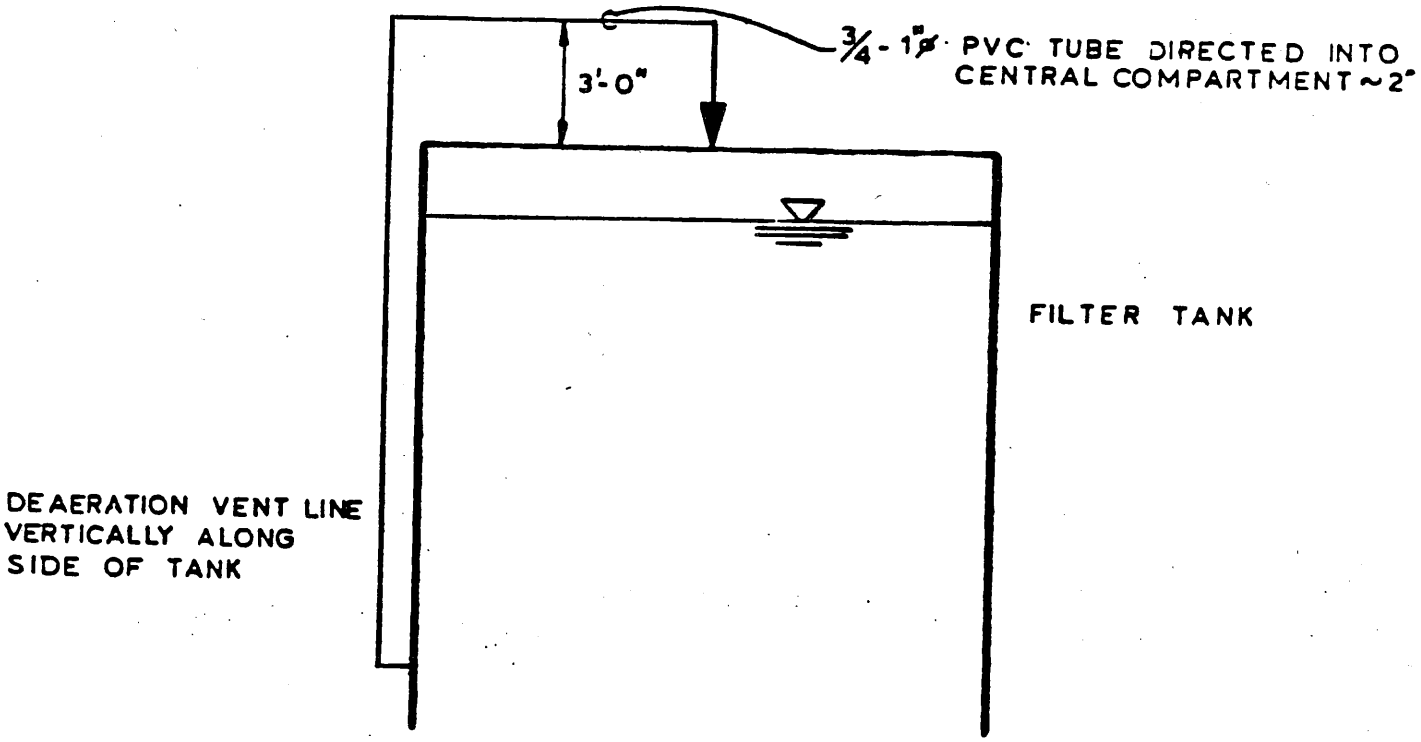
Inch Scale or Headloss Scale and Deaeration Line

See drawing package; drawing entitled Head Loss Gauge. This item is a ruler mounted to a metal bracket. A transparent hose is attached to the bracket. This scale which is shipped loose, is used to measure the headloss through the sand bed. Position the inch scale or headloss scale on the lip of the filter tank so it can be easily observed. Attach the transparent hose on the inch scale to the pressure tap. The pressure tap is located coming off the center of the manway cover. Please refer to your general arrangement drawing for proper location. Two valves are aligned vertically on the pressure tap. The top attaches to the inch scale transparent hose, the lower is a sample tap.

The unit contains deaeration air vents which atmospherically vent air from the filter if air should become entrained. The vents run vertically along the tank wall. Depending on the model size, there may be one to three vents and they run on the outside of the tank (see Figure 1). Extend these air vent lines three feet above the top of the unit with tubing or hosing and direct these tubes to the central compartment (Figure 5).

Figure 5

DEAERATION VENTS



Sand Addition

Pages 9-10 of DS-317 describe the quality of sand needed to ensure proper operation of the DynaSand Filter.

NOTE:

IT IS IMPERATIVE TO KEEP LARGE FOREIGN OBJECTS OUT OF THE FILTER. BE SURE ALL TRASH IS REMOVED FROM THE UNIT BEFORE THE SAND ADDITION AND ENSURE THAT LARGE OBJECTS DO NOT ENTER THE FILTER AT ANY TIME. THE INSPECTION MANWAYS SHOULD BE REMOVED AND EACH INNER CONE INSPECTION INLET REMOVED JUST PRIOR TO THE SAND ADDITION, TO ENSURE ALL OBJECTS HAVE BEEN REMOVED. THESE SHOULD THEN BE REPLACED AND THE WATER AND SAND ADDED PER INSTRUCTIONS.

NOTE:

ONCE FILTER HAS SAND IN IT, ALWAYS FILL THROUGH FEED INLET. DO NOT FILL FROM THE TOP OR SAND BACKFLOW WILL RESULT.

Before adding sand, check piping connections and ensure filter components are in good condition and in the proper position (page 3). If they are not, you may have to empty the filter of all sand to correct a very minor problem. Fill the filter with water to a level just below the sand washer before adding sand. Fill the water at a low rate (20-30 gpm) from the TOP of the unit. Filling an empty filter from below could cause shifting of the internal components. To exclude large loreign objects or pieces of trash from entering the unit, place a coarse screen over the filter. A large amount of dust is in new sand. If sand addition is made by a pneumatic truck, it is advisable to cover the unit in a simple manner (plastic, plywood or cardboard), while filling to control the dust. A dust respirator in compliance with OSHA Standard 1910.134 must be worn by all personnel associated with sand loading. For additional information, a Material Safety Data Sheet is included (see Page 10). Sand addition at a very high rate will result in splashing water and the possibility of damaging the internal components. Therefore, add the sand slowly and evenly across the filter. Don't add all the sand in one location, but change frequently from one side of the filter to another. Failure to do so may cause uneven load and the internals could shift. To correct this, all sand has to be removed from the filter.

Fill the unit with sand until the level is 6 feet below the top of the filter unit. Use a measured rod or pole to determine the sand depth level. Constantly measure the amount of sand in the unit with this pole and do not add the entire amount provided, since in most cases more sand is provided than actually required. This is due to the potential of losses in transit, etc. Therefore, a small quantity of sand will probably be left over after the unit is filled to the proper level. If the sand arrives in bags, it is advisable to store this sand in a dry area for possible future use.

Chemical Name & Synonyms:	Trade Name & Synonyms:
Silica Dioxide (Silica)	Fracsand Pulverized Sand
Chemical Family:	**Formula:**
Silica - Natural Mineral	SiO2

Health Hazard Data

Threshold Limit Value:

As specified in OSHA Standard 1910.93, Table G-3 for Silica Crystalline Quartz

Effects of Overexposure:

Repeated inhalation of dust over an extended period of time may result in injury to the lungs.

Emergency and First Aid Procedures: NONE

Reactivity Data

Stability: Stable

Hazardous Polymerization: Will not occur.

Spill or Leak Procedures

Steps to be Taken in Case Material is Released or Spilled:

Clean up with use of dustless method.

Waste Disposal Method: Any - not hazardous.

Special Protection Information

Respiratory Protection (Specify type):

Dust respiration in compliance with OSHA Standard 1910.134.

Ventilation: Follow OSHA Standards

Protective Gloves: Not necessary

Eye Protection: Normal for dust

Other Protective Equipment: None

Special Precautions

Precaustions to be taken in handling and storing: None other than above.

Other Precautions: None other than above.

Reject Weirs and Reject Rate

A certain amount of reject water is needed to wash the filtered suspended solids off the sand (see Page 2). The amount of reject needed to thoroughly wash the sand depends on the application. The reject rate in some cases in physically dependent on some factors (as sand rate), however, the reject weirs are utilized to control the amount of reject water produced. Varying the height of the reject weir will vary the amount of reject water.

The reject weirs are plastic plates shipped loose. You should receive approximately 6 plates which are various heights and are designed to slide into a slot in the central compartment (see drawing Wash Housing and Central Compartment).

Install the two largest reject weirs in the central compartment and place the remainder of the weirs in an accessable location. The start-up section defines the proper amount of reject needed.

Because the reject rate is an important parameter in filter operation, provide a means to measure the rate. In most cases, the rate may be very small and accessability to the reject line for measurement with a bucket and stopwatch would be sufficient. Other types of volumetric measurements with time are also acceptable. Calibrated flow meters may be hindered as the reject may contain high concentrations of suspended solids.

Sand Washing Procedure

A certain amount of dust and suspended particles are normally present in the new sand. It is therefore, advantageous to wash the sand. This may be accomplished by either pumping clean water through the sand filter feed piping or placing a hose over the top side of the unit. The amount of water required is usually 10-20 gpm. The reject weirs should be placed at a height so that all the water is reject discharge. The air rates should be adjusted to normal operating conditions (page 13). The sand will be thoroughly washed when the reject water has cleared. Due to the flat edge in the washer central compartment, some particles may accumulate there. This must be periodically removed.

3. PRESTART-UP CHECK

Before you attempt a start-up of your own or before you call in start-up assistance, the different components should be checked and test-run separately.

+ Check all piping and connections.

+ If the filter is full of sand and water, do not open the filter influent valve unless the upstream water level is equal to the level in the filter or the pump is equipped with a check valve. (Close the filter bypass line before opening the filter influent line.)

+ Test run the pump or gravity feed the filter for a short period of time. Don't run the feed for more than a couple of minutes.

+ Check air supply. Regulate the pressure in the air panel to 30 psi. Make sure that the maximum SCFH on the airflow meter can be flowed through the airlift without any excessive pressures needed (6-8 psi needed downstream of the airflow meter).

+ If chemical pretreatment is required, check that dosage equipment, etc. is working with desired output and that chemicals are on site.

+ Check that the sand is at the proper level, and that reject weirs, deaeration vents, headloss scale and splash hood are in place.

+ Open the valve on the pressure tap to the inch scale.

+ Check other equipment manufacturer's start-up instructions.

4. START-UP

The following procedure should be utilized for initial start-up of a DynaSand Filter.

+ Close the filter bypass valve (if applicable) before opening the filter influent valve. Start the feed at a reduced rate (20-25% of design rate).

+ Start the air supply so sand is lifted to the top of the unit. Adjust to approximately 90 SCFH of air as a safe starting condition. If the air supply fairs or if the airlift doesn't lift sand, shut off filter feed. (See "Troubleshooting")

+ Allow the filtrate and reject weirs to overflow. Measure the reject rate. Insert or extract weirs so the reject rate is approximately 10 gpm.

+ New sand has some impurities (mainly dust and clay) that have to be washed out. (Refer to sand washing section, page 11). Allow at least a couple of hours for this process. Monitor the headloss during this time. The headloss (Delta P) is measured as the difference between the water level in the headloss scale transparent hose and the water level in the filter tank. The difference can be read directly on the headloss scale. When the sand has cleaned out and the headloss has remained stable, slowly increase the feed flow to the design rate. Do not exceed design rate.

+ Check to see that sand is being transported to the top of the unit and measure the reject rate to ensure it is stable.

+ The Delta P will be in the neighborhood of 18 inches at the design flow of 210 gpm and 20 ppm feed suspended solids.

+ If an increase in Delta P occurs for an extended period of time due to higher feed suspended solids, then increase the sand (air) rate and adjust reject rate if necessary. Allow this condition to run for a couple of hours. Monitor the Delta P to ensure it is stable.

+ After the operator is familiar with the installation and the plant (upstream) conditions are stable, the sand (air) rate and reject rate may be decreased for more optimum performance (if design conditions are prevailing). For stable operation, it is suggested not to decrease the air rate below 85 SCFH and the reject rate below 7 gpm.

NOTE: Air flows above 150 SCFH might cause excessive splashing and/or sand loss.

+ Keep an Operator's Log to monitor the performance of the DynaSand Filter. See Table I attached. Ensure that this Log is attended to on a daily basis.

5. SHUT DOWN

Short Time

If the filter is to be shut down for a brief period of time, stop the feed to the unit, close the filter feed valve and stop the air flow to the unit. If shut down occurs frequently, refer to DS-317 for proper installation of on/off mechanisms.

Long Time

If the filter is to be shut down for a long time (1 day or more), the following procedures should be utilized:

+ If the filter has been running at low feed suspended solids concentrations, (typically 20-30 ppm) then the SHORT TIME procedure can be used.

+ If the filter has been running at high feed suspended solids concentrations, then there will be an inventory of very dirty sand in the DynaSand Filter. It is not recommended to keep very dirty sand in the filter for a long period of time, therefore, the sand bed should be cleaned before the filter is shut down.

+ Reduce the feed rate or turn off the feed and pump some filtrate into the unit (the filtrate can be fed into the filter at the top). A hose with potable water can also be fed into the top of the filter. The total rate should be just above what is needed to produce enough reject, i.e. very little filtrate should be produced.

+ Continue to run airlift for at least a couple of hours producing reject. When the reject turns very dilute, the filter can be shut down using the SHORT TIME procedure.

6. TROUBLESHOOTING

Poor Filtrate Quality

+ Check that the reject rate is high enough to give efficient washing of the sand. If higher than recommended sand (air) rate is used then the reject rate has to be increased by lowering the reject weir height (page 11).

+ Check that Delta P is not excessive (see below).

+ Check feed rate and influent solids. If excessive, check for upset conditions in upstream equipment.

+ Check pH and chemical pretreatment if such is employed.

If Headloss (Delta P) Increases

+ Check that the feed suspended solids concentration and the influent feed rate is in the predetermined range.

+ Make sure that air bubbles and foreign materials are eliminated from the headloss line. If this line plugs, open the sample tap below it to flush the line. Shut valve to measure Delta P.

+ Make sure that the airlift is transporting sand. (If not, see below, Airlift Not Functioning Correctly).

+ Excessive use of polyelectrolyte can increase Delta P and even plug the sand bed. Reduce the polyelectrolyte dosage.

+ Adjust the sand (air) rate so that the sand bed cleans at a faster rate. Adjust reject rate to ensure proper washing of the sand.

+ Check washer for proper operation. (If not, see below, Plugged Washer.)

+ If none of the above helps, it is advisable to reduce the flow rate to the filter until the cause for the excessive pressure drop is established.

Plugged Washer

+ Check area in washer assembly and remove any foreign material causing blockage. Make sure spiders, rings and spacers are properly positioned.

Airlift Not Functioning Correctly

+ If airlift lifts only water or just a small amount of sand (this may happen if the filter has been grossly overloaded for an extended period of time:

    + Turn off air supply and "bump" the airlift by immediately turning it on at a higher air rate. Ensure there is an air supply to the unit.

+ If above doesn't work, then stop the feed flow for about one minute and try above again, then restart feed flow.

+ If the DynaSand Filter is equipped with a "help start", (Model DSF-64, shorter of the 2 stainless steel lines at the top of the airlift, see drawing Sand Wash Housing and Central Compartment), attach a water line to it and inject small stream of water. Start air flow. When sand starts to flow, shut off water to help start.

+ Attach a metal probe (stiff tubing or spray nozzle) to a garden hose and insert into airlift. Inject water through hose and start air flow. When sand starts to flow, extract probe.

+ Stop feed flow and air to unit. Thoroughly drain unit of water (see Miscellaneous), check around airlift for blockage by foreign materials through the manway port and inner inspection port (see Figure 1).

+ Turn on the air flow and read the rotameter reading. If there is no reading (rotameter ball does not rise) take off the air supply line to the airlift. Turn on air supply. If there is still no air reading on rotameter, check that the rotameter or air supply lines are not plugged. If air does flow, this could mean the airlift chamber or line is plugged.

+ Check downstream air pressure gauge for excessive pressure, which would indicate a blocked airlift screen. If pressure is excessive, remove airlift and clean screen.

+ If previous steps have not resolved the problem, take out and inspect the airlift (see Miscellaneous, Page 21).

Filter Flow Capacity is Highly Reduced

+ Check items under "If Headloss (Delta P) Increases".

+ Open the sample tap and ensure that sand has not backflowed into the feed line (see Miscellaneous).

+ If the filter is plugged completely by running it without the airlift in operation or severely overloading the unit for a long period of time, the whole bed may have to be scoured before normal operation can start again. This can be done by introducing compressed air into the top of the filter through probes. Continue the air scour for 15-30 minutes before resuming normal operation at a reduced flowrate. The filtrate will be very dirty after the air scour since all the impurities will be scoured from the bed and lifted into the filtrate compartment.

7. MAINTENANCE

The filter will normally not need much attention while in operation. The only maintenance involved is cleaning of the Delta P measuring hose and occasional hosing down of the flumes, etc., if needed.

It is recommended to remove the airlift for inspection once a year. At this time, the screen located in the air supply chamber (close to the lower end of the airlift) should be inspected and cleaned if necessary (see Miscellaneous).

In order to monitor the performance of the DynaSand Filter, it is suggested that a log be kept. A sample log sheet is attached as Table I.

In some instances, suspended solids can collect in the skirt section of the filter. Opening the sample tap on the manway cover can reveal if solids are building up in this section. Occasionally, the skirt area sshould be hosed out (if needed). Drain the tank (see Page 19) and remove the manway cover. Take precaution if tank entry is required (see Page 24).

8. MISCELLANEOUS

Draining the Filter

The filter should always be drained through the drainage connection. The drainage connection is located on the tank wall close to the bottom.

cylindrical filters have two drain valves, a skirt and inside drain. Please refer to your drawing package. The tank should always be drained through the inside tank drain, which is the higher of the two drains. Drainage through the skirt drain should be done only when the tank is empty.

Disconnecting the Feed Line

The filter has to be drained before the feed line is disconnected. If the feed line is opened while the filter is full of water, then the water will backflow at a high rate due to the static head, causing a sand backflow into the skirt area. This can be avoided by positioning a check valve at the inlet flange to the filter.

Sand Removal and Reinstallation

+ Stop feed flow and air to airlift.

+ Attach a line to airlift and direct it to a sand holding container (Figure 7).

+ Turn on air supply and allow sand to be pumped to container.

+ This method will be effective if the filter is kept full of water all the time. Add water to the unit through a garden hose. Keep the water level of the tank up to the reject weir.

+ NOTE: It is always more convenient to put the sand in a container (drum, buckets, tank). Containers allow good storage facilities and also make it easier to put the sand back into the filter. If a tank as tall as the filter (or 2-3 feet shorter) can be used for storage, set the tank next to the filter. Pump the sand from the filter to the tank and back again using the airlift from the filter.

+ If your filter is small (models DSF-7, DSF-12, DSF-19), pump the sand into drums (5-55 gallon capacity). These amounts can then be loaded into the filter with the aid of a forklift or it can be done by hand.

If the sand can be held in a smaller tank, auxiliary equipment may be used to move the sand back into the filter. Diaphragm pumps, trash or slurry pumps, and aspirator systems can be used. The sand can be moved effectively using these pieces of equipment provided it is in a slurry form (sand needs to be heavily watered).

If sand containers are not available, put the sand on a cleaned section of the floor and replace into the filter with either buckets or conveyors.

Regardless of how sand is put back into the filter, insure that large objects are kept out. (See Sand Addition, Page 9.)

Airlift Removal & Installation

+ Remove air line from air panel to airlift supply line.

+ Block or tape to prevent foreign objects from entering air line.

+ Remove splash hood.

+ Attach lifting handle and lift airlift out of protective tube assembly. If sand binds and restricts removal, turn top of airlift with pipe wrench. Insert tool and lift again (see Figure 6B). Lift airlift out of unit with this eye.

+ To inspect the airlift, unscrew the bottom portion from the assembly (Figure 6C). The screen will now be visible should be cleaned well before reassembling. Insure "O" rings are in good condition and seated in grooves. Look for potential wear on steel parts.

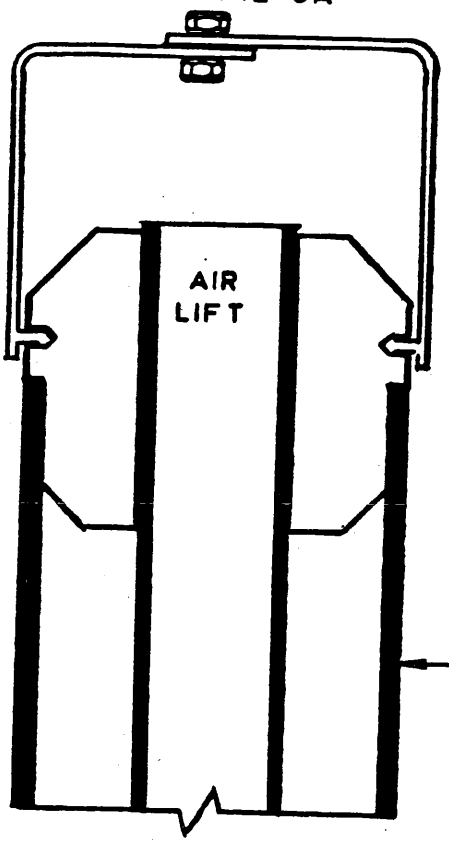
+ Clean out airlift supply line with wire or high pressure hose.

+ Reassemble airlift and insure air flows through it without high pressures (should be little pressure drop through clean airlift).

+ Place airlift back into unit. Allow it to drop until it is stopped by the sand. Attach air line and start air to lift sand. Direct the sand away from the protective tube/airlift area. Use a hose as in Figure 7 to channel the sand away. Let airlift then "slide" into place. Ensure it is fully seated in the protective column.

AIR LIFT

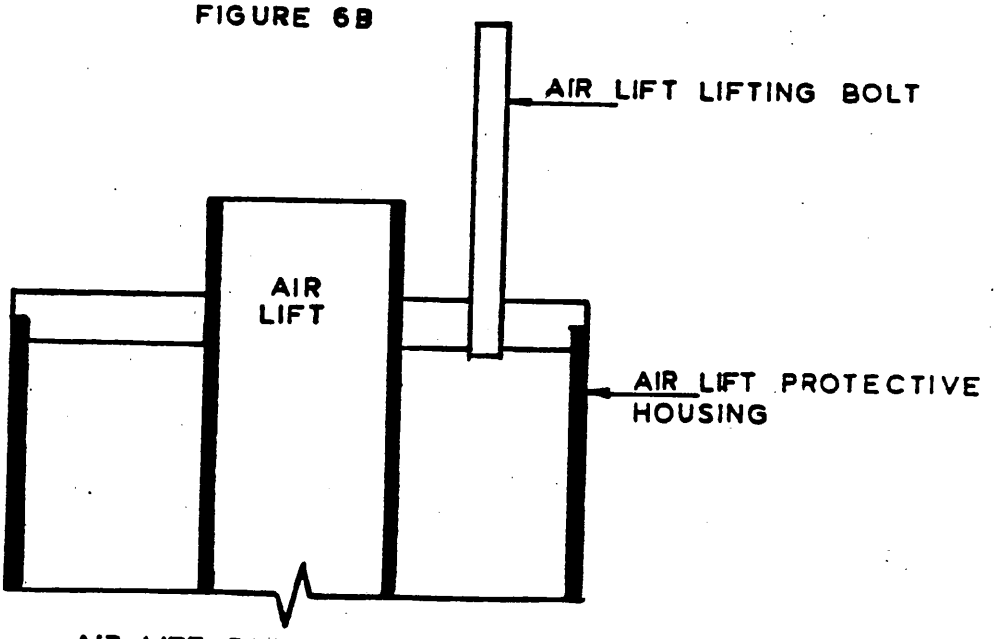
FIGURE 6A



SPECIAL TOOL:
SPREAD TOOL AND INSERT ENDS INTO HOLES IN AIR LIFT. PULL AIR LIFT UP W/ PULLEY LIFT.

USE OF AIR LIFT LIFTING TOOL
(ALL MODELS EXCEPT DSF-64)

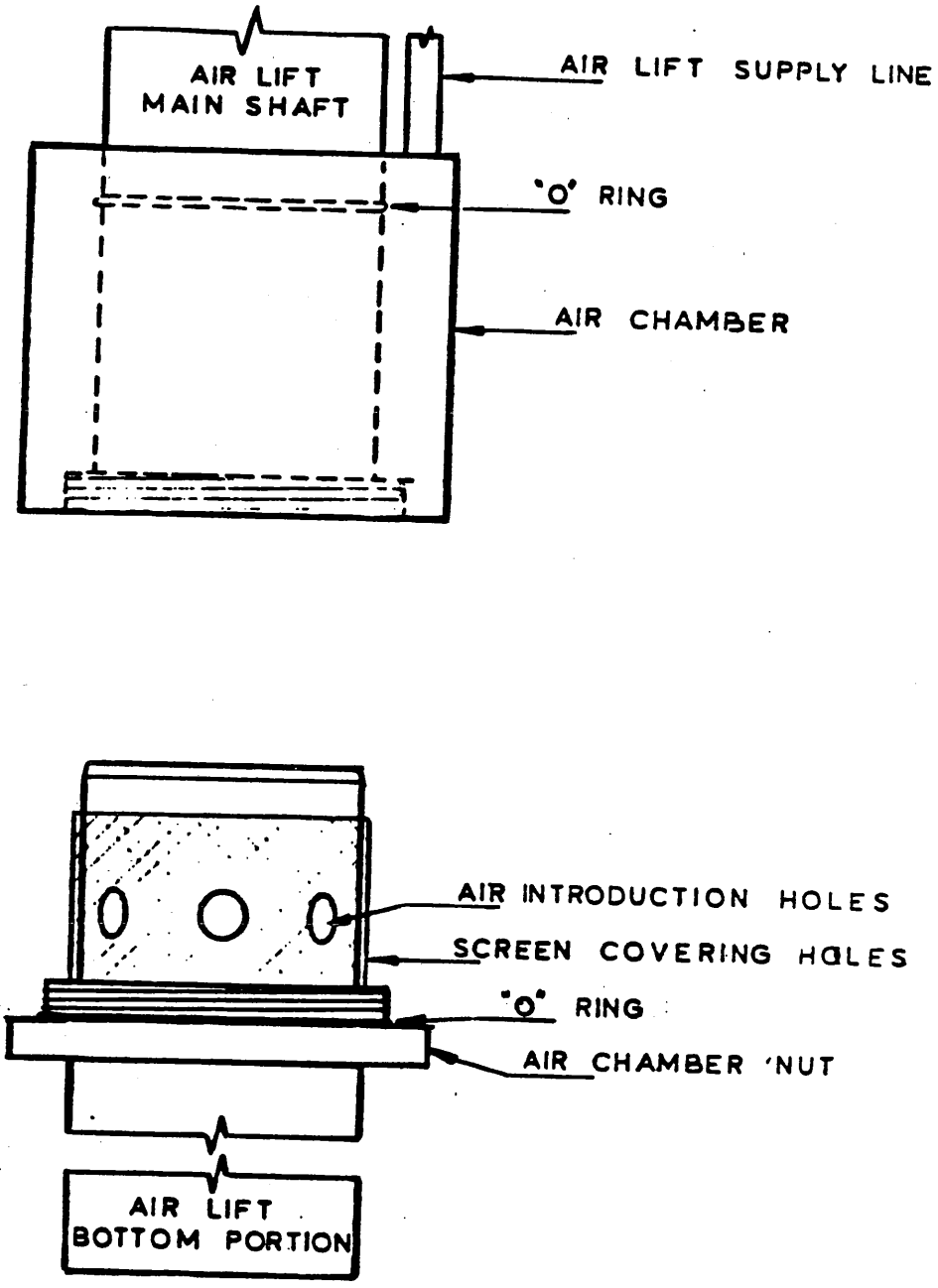
FIGURE 6B



AIR LIFT REMOVAL FOR
MODEL DSF-64

Figure 6C

AIR LIFT DISASSEMBLY

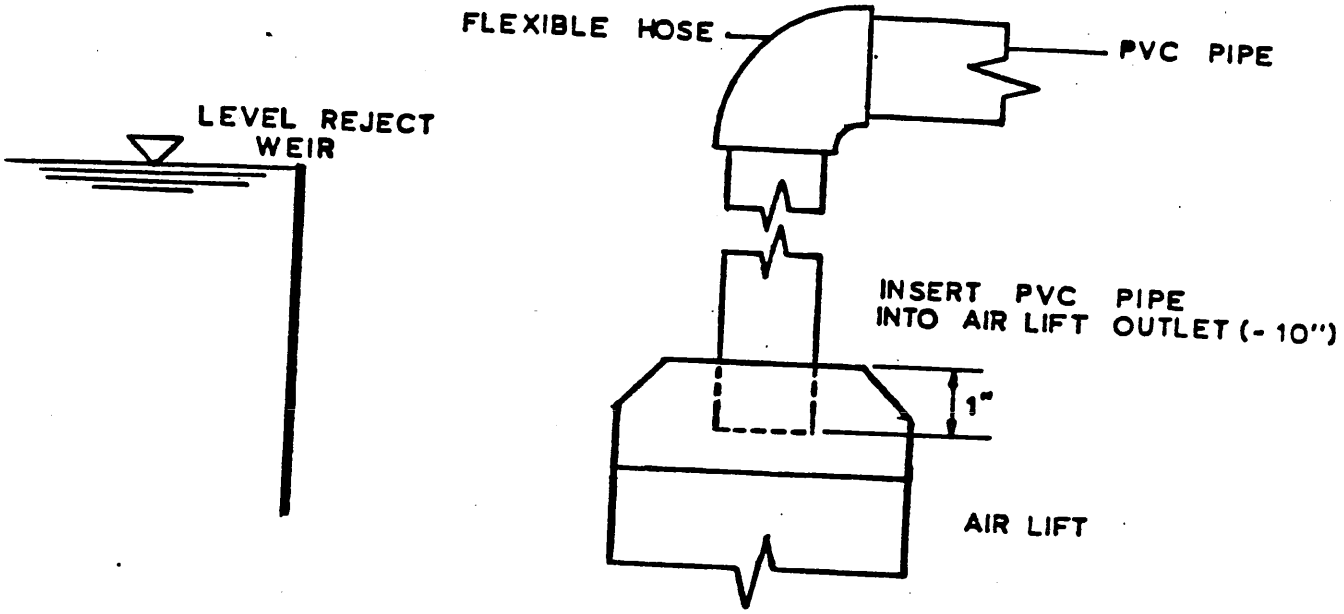


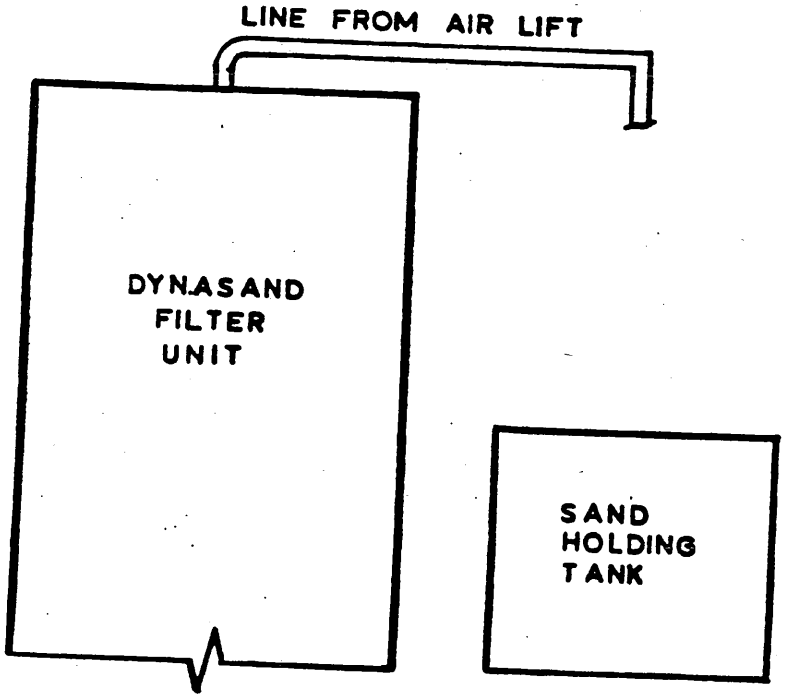
BOTTOM PORTION OF AIRLIFT SCREWS INTO MAIN SHAFT OF AIRLIFT.

USE CAUTION WHEN SCREWING OR UNSCREWING. BOTTOM PORTION OF AIRLIFT BENDS EASILY.

Figure 7

SAND REMOVAL





Removal of Sand from Feed Line

In order to prevent this in the future, please refer to DS-317 and "Start-up" section of this booklet.

To remove the sand in the feed line:

+ Completely drain the filter of water.

CAUTION

Prior to entering the manway, visually inspect the skirt area for sand leaks. Sand backflowing through the riser tubes will be evidenced by mounds of sand beneath them. Sand around the periphery of the tank or in other areas may indicate a damaged cone (IN NO EVENT SHOULD THE SKIRT AREA BE ENTERED WITHOUT FIRST REMOVING ALL SAND FROM THE FILTER WHEN DAMAGE TO THE CONE IS SUSPECTED).

+ Remove the manway cover and remove the sand in the feed area.

+ Using a water hose, inject water into each riser tube until each riser is free of sand.

+ Detach feed line and free the line of sand.

CALCIUM SCALING

A. Formation:

Calcium scaling can occur when calcium ions and sulfate or carbonate ions are present in the same waste stream. Usually this happens when lime and/or sulfuric acid are used for pH control. Resulting calcium sulfate or calcium carbonate forms relatively insoluable deposits which occlude to the sand and, over a period of time, can cement areas together creating hard spots. Calcium sulfate also combines with an average of 19 molecules of water and crystallization forming plaster of paris. Ten to fifteen minutes are required to reach completion so the reaction which starts in the neutralization tank can carry over into the sand filter.

B. Detection:

As the calcium sulfate or carbonate coats the sand grains, the sand changes to a grayish color and the bed expands. Over a period of time, the bed can grow until clean sand flow from the bottom of the washer is cut off. Periodic measurement of sand level will give an early warning.

Another potential problem resulting from calcium sulfate or carbonate deposits on the sand is airlift pumping problems. As the sand begins to cement together and develop hard spots, it will not flow into the airlift pump evenly and the airlift may not operate properly. It is important to observe if scale if forming on the sand and to take preventative action before it becomes a big problem.

Probing of the sand bed with an appropriate length of 1/2" CPVC water pipe will identify hard spots. CPVC pipe is recommended because it is lightweight, flexible, strong, has good sentitivity, and will not damage internal FRP parts or scratch painted surfaces.

C. Prevention:

Prevention or control of scaling can be implemented in several ways:

1) Use caustic in place of lime, or hydrochloric acid in place of sulfuric acid in neutralization.

2) Use a scale retardent-dispersant to keep the calcium sulfate or carbonate from coating the sand.

3) Keep the sand bed moving whenever the feed flow is off, or wash the sand for four hours before shutting down the filter. This can be done by piping a water supply into the top of the filter and interlocking with the feed so that water is dumped into the filter to provide a reject flow whenever the feed flow is stopped.

D. Removal:

Correction of a scaling problem which has continued for too long can be accomplished in two ways:

1) Acid wash the sand by maintaining the pH of the water in the filter between 3 and 4 with inhibited hydrochloric or muriatic acid while the sand is circulated with the airlift. This process will take 8 to 12 hours. Progress can be monitored by probing the bed with CPVC pipe and air-lancing the bed where necessary. At completion of acid cleaning, the filter sand should be washed with fresh water until the reject is clear. It is then ready for operation.

2) The contaminated sand can be pumped from the DynaSand Filter and discarded in an approved manner. New sand should be installed, washed with fresh water and placed in operation.

NOTE: The DynaSand Filter can handle higher levels of calcium sulfate or carbonate than conventional filters without operating problems. Some scaling on the sand can be tolerated due to the high degree of air scouring and backwash in the airlift. Normal levels of calcium sulfate or carbonate are controlled without fouling the sand since the sand bed is continually moving and is vigorously cleaned; however, excessive scale formation can cause problems.