JOB NUMBER, JOB NAME, CITY, STATE

VACUUM SAND COMPAK (VSC)FILTER WITH AIR SCOUR BACKWASH
Standard Compak-with Evacuator for indoor filter rooms

Introduction

The filter on your pool is a vacuum type filter, which utilizes sand as the filtering medium. A vacuum filter is one in which the water to be filtered is in a tank open to atmospheric pressure into which the unfiltered water flows by gravity and is drawn out by the pump through the filter media. This filter system, with proper care and maintenance, will give trouble free and efficient operation.

The filtering principle is simple. Sand is used to filter out all of the dirt suspended in the water. Pool water is drawn in through this layer of sand and it is returned to the pool. Pool water enters the filter chamber from both the bottom of the pool and from the perimeter overflow system channel.

The perimeter overflow channel flows freely to the filter. When the flow increases a preset hydraulic balance will cause less water to come from the bottom of the pool. When there is little or no water flowing from the channel, the main drain line is designed to supply the total required flow rate.

The filter compartment receives water from the main drain and the perimeter overflow (PO). Water entering the filter chamber passes downward through a water distribution and vacuum equalization screen, through sand, and out the underdrain system. When dirt builds up in the sand and the desired flow rate can no longer be maintained, the filter is cleaned by simply reversing the flow.

The water in the lower part of the sand bed is under vacuum. As the pressure of the swimming pool water in the filter is reduced below atmospheric, dissolved gases are released. The order of release will follow their vapor pressures with the more volatile being released first. Among the first will be nitrogen trichloride. This has a beneficial effect on the water in that many of these gases, such as nitrogen trichloride, are irritating to the swimmers. An automatic electrical control device is provided with the paddock vacuum sand filter to ensure the release of the entrapped gases.

Studies have shown the gases, if not allowed to bubble out of the media bed, will impede the flow of water through the sand. This has much the same effect as contaminant particles reducing the filtration efficiency and increasing the frequency of backwashing. The gases removed are released at regular intervals by the automatic gas release system.

The filter is designed to run 24 hours a day. To operate economically and efficiently, the system has been designed to shut off approximately one minute in each 10-hour period to allow for the escape of accumulated gases. The automatic gas release system also provides vacuum protection for the pump and motor. Should the preset maximum vacuum of 16" be reached, the pump will automatically be shut off and remain off until the vacuum limit switch (VLS) is manually reset and the pump restarted.

Operating Instructions:

To assist in these operating instructions, all valves on your VSC filter have been permanently tagged with a tag containing a number. The valves are numbered as follows:

1. Main drain	7. Perimeter overflow
1A. MOL set valve	8. Main drain backwash influent
2. Pump header suction	9. Automatic water make-up (solenoid)
3. Filtered water return to pool	10. Manual make up water control
4. Backwash trough suction	11. Water make up solenoid isolation valve
5. Backwash discharge (pump to waste)	12. Air scour control
6. Underdrain control	12A. Manual air bleed

Note: All valves open counter-clockwise and close clockwise as indicated on the valve handle or gear operator.

Construction Details:

The filter tank contains:

a. A main drain control valve.

b. A piping header, which controls the main drain influent flow for filtering, backwashing, and draining pool.

c. An underdrain system of the header lateral type placed at the bottom of the tank.

d. An air scour system of the header lateral type placed at the bottom of the tank.

e. The sand bed consisting of an 18" layer of 0.45 to 0.55 mm filter sand supported by a layer of 1/16" to 1/8" (roofing) gravel.

f. A water distribution and vacuum equalization screen. This is perforated corrugated fiberglass supported by angles welded to the tank. This screen covers the entire filter chamber and is installed over the sand bed just above the backwash trough.

The purpose of this screen is to evenly distribute water entering the chamber and to create a uniform vacuum above the sand bed. The equalization screen is installed in sections with each section being light and easy to remove if required. All sections have holes 3/8" in diameter drilled on 6" centers.

g. The P.O. channel outlet valve(s). This is above the equalization screen and controls the entry of water from the P.O. channel.

h. The recirculation pump.

i. The return and waste line control valves.

j. The automatic gas release system consisting of an adjustable 24-hour timer preset to 10 hours, a vacuum limit switch on the filtered water outlet that stops the recirculation pump when preset 16" hg is reached, and a manual on/off recirculating pump control switch.

k. Variable Frequency Drives (VFD) are an option for this filter.

Initial Start-Up:

The following steps are to be taken when you place your Vacuum Sand Compak (VSC) filter in operation for the first time:

1. Check pump rotation to ensure that the motor has been correctly wired.

    a. **Note:** the impeller should rotate in a clockwise direction when viewed from the motor end. If rotation is opposite, the motor has been incorrectly wired.

2. Flush out main drain line before filling pool.

3. Clean interior of filter of debris and check all bolts and nuts for tightness.

4. Check all electrical connections to Mark V filter control panel and motor starter.

5. 110v input power to 1 & 2 on terminal strip in Mark V box.

6. Output power from terminals 3 & 4 to motor starter coil, auxiliary remote contacts, or VFD if present.

7. Heater and UV connections from 7 & 8 on terminal strip.

8. Gauges on Mark V should be connected with ¼1/4" tubing to proper fittings provided—compound to suction usually located on pump box wall and pressure to discharge side of pump usually on volute.

9. Place valves in backwash configuration (refer to backwash instructions) and backwash filter thoroughly, then place into filter.

10. Check timers on interior of Mark V panel for proper settings. Start with the left timer representing burp hours. The small window of this timer should indicate 24 HRS. If not, adjust small screwdriver slot on top right of timer. Dial on front of timer should be set on 10. Next timer to the right is the Heater/UV timer. The top right window of this timer should indicate 10 MIN. Adjust on top of timer as before if necessary. The dial on front should be set on 10. The final timer should indicate 1 MIN and can be adjusted as before if necessary. This timer should be set for 30 seconds for Burp time. Note: On rare occasions if pump loses prime with this timer set at 30 seconds it should be adjusted to 1 minute.

11. Vacuum switch should be checked for proper setting and operation by slowly closing down pump suction. When 16" of vacuum is achieved, pump should shut off and VLS light should come on. If this doesn't happen, remove gray metal cover from vacuum limit switch just below Mark V box. Adjust the screw on the top right of switch until the motor shuts off. Reset VLS and try again to be sure of setting. Replace cover.

12. Run filter overnight and then backwash again to be sure filter is clean.

13. Set minimum operating level (MOL) by closing return to pool valve (#3) to specified recirculation rate. Close the perimeter overflow valve(s) (#7) and slowly restrict Valve (#1A) to achieve a water level in the filter roughly equal to the centerline of the main drain pipe in the filter. Lock Valve (#1A) in position and MOL is set.

In many areas, when a new pool is filled, the water may appear green or cloudy. This green and/or cloudy appearance can be caused by "marcite" plaster, traces of iron or organic matter or algae in the makeup water and will clog any type of filter in a relatively short period of time. If the pool is cloudy, we recommend that it be super chlorinated immediately after filling and that the filter be backwashed promptly when the vacuum limit switch causes the filter to shut down and the vacuum is not appreciably reduced upon restarting.

If any appreciable amounts of iron are present, they will turn brown upon chlorination and may stain the interior finish of the swimming pool. Chlorinate a small sample of water first. If it turns brown, the water should be treated to remove the iron. The backwashing operation may be required daily or even several times a day until the water becomes sparkling blue.

Backwashing the Filter:

The filter should be backwashed when the pump is stopped by the VLS indicating backwashing is required or if visual vacuum readings are high (14" hg plus) and pool clarity is poor. (Pool clarity issues can also be due to chemical imbalance)

Shut off UV, Heaters, chemical controller(s), Water Level Controller, etc. 5-10 minutes prior to Backwash.

1. Reset vacuum limit switch if tripped. Close Main Drain valve (#1) and Perimeter Overflow valve (#7). Draw the filter tank level down to top of sand bed, opening backwash viewport to see. Slowly close return to pool valve (#3), then shut off pump. Close Pump Suction Valve (#2).

2. Open Air Scour Control valve (#12) and turn on air scour blower. Run 3-5 minutes while monitoring sand bed to ensure water is not bypassing valves. Once the sand bed is thoroughly agitated, turn off air scour blower and close valve (#12). If the water level does start to rise during air scouring, turn off the air scour blower immediately. Re-check vales (#1, #7, and #3) for full closure. If water rises above backwash trough during air scouring, it will allow sand to enter said trough and potentially return to the pool after the backwashing cycle.

3. Open Backwash Influent valve (#8) and Air Relief valve (#12A). Allow water level in the tank to rise until it reaches the bottom of the motor box. Close Backwash Influent valve (#8) and Air Relief valve (#12A).

4. Open Backwash Suction valve (#4). Start pump and open Backwash-To-Waste valve (#5) slowly to the designated flow. Draw the filter tank level down to the equalization screen. Look through backwash viewport and open Backwash Influent valve (#8) to regulate and maintain water level just below equalization screen, allowing dirty water to flow over edge of backwash trough. Backwash 3-4 minutes or until the sight glass is clear.

5. Close Backwash Influent valve (#8) and turn off pump. Close Backwash Suction valve (#4). Close backwash viewport window. Open Perimeter Overflow Valve(s) (#7) and Main Drain Valve (#1) allowing water level to rise to maximum level. Open Pump Suction Header valve (#2) and turn on filter pump. Rinse filter to waste 15-20 seconds.

6. Open Return to Pool #3 to first setting or notch while slowly closing Backwash-To-Waste valve (#5). Then set Return to Pool valve (#3) to marked position for designated flow rate.

7. Run 2-3 minutes and check operation, turn on UV, heaters, controllers, etc.

When backwashing, it is important to keep the water level in the filter compartment just above the top lip of the backwash trough partition to maximize the efficiency of the backwash flow and dirt removal. This can be observed through the viewport window in the equalization screen. With the proper setting of the backwash discharge to waste valve (#5), the backwash flow can be easily maintained at the proper level in the filter tank and in the backwash trough by modulating Backwash Influent valve (#8).

Helpful Hint: It is recommended that a manual backwash at the maximum flow rate allowable by backwash water receptacle capabilities for an extended time of 5-6 minutes is done a minimum of once a year. The air scour feature is not used during this suggested preventive maintenance backwash. This suggested manual extended flow backwash extends the media life & could prevent having to replace the sand in your filter.

To Filter:

Ensure that pump rotation is in the correct direction at startup.

Valves (#1), (#2), (#3), (#6), (#7), & (#11) are open. Valve (#1A) is closed to the previously set MOL and locked in place. Valve (#1A) should be left in this position for all filter operations. All other valves are closed.

Checking the Flow Rate:

The recirculation pump is designed to deliver the required recirculation flow of ____**GPM** at a total dynamic head of _____**feet**. **REFER TO DRAWING(S)**

Total dynamic head on the pump is a combination of the vacuum and discharge pressure losses. The conversion factors for the vacuum and pressure reading to feet of head are:

1. 1” of vacuum equals 1.13 feet of head.

2. 1 psi equals 2.31 feet of head.

Procedure (With A Clean Filter):

1. Set all valves to “filter” mode. Valve (#1A) is already set.
2. Start the pump and read the vacuum gauge.
3. Convert the vacuum reading to feet of head by multiplying by 1.13.
4. Subtract the vacuum reading expressed in feet (as found in #3 above) from the design total dynamic head of your pump.
5. Divide the results of #4 by 2.31. This is the desired pump discharge pressure to obtain the total designed dynamic head and, hence, with the diameter pump impeller supplied the designed flow rate.
6. Restrict valve (#3) by adjusting the gear operator until the pressure on the pump discharge gauge reads the result of #5. Recheck the vacuum gauge and make adjustments if necessary.

The pump manufacturer guarantees the flow based on their pump curves to within 5%, which is more accurate than the flow meter which is subject to distortion. When the system is properly set as described here, the reading on your flow meter is (and should be noted as) the proper recirculation rate for your pool. Mark the position of the indicator arrow on the gear operator on valve (#3) and return it to this setting after each backwash.

Note: If the filter pump for the pool loses prime during filter or backwash, follow these steps:

1. Turn the filter pump off.
2. Open manual air bleed tube located in the pump box and open valve (#12A) to allow any trapped air to escape.
3. Check to make sure all valves are in the proper position.
4. Allow the water in the filter tank to equalize with the pool.
5. Once the water in the filter tank has equalized with the pool, close air bleed tube in pump box and valve (#12A).
6. Turn the filter pump back on.

General:

If debris accumulates on the vacuum equalization screen, it should be removed at regular intervals. This can be accomplished during backwashing. If it is necessary to enter the filter chamber, use the ladder provided and put your weight directly over the support angles.

The Vacuum Equalization Screen (VES) is held in place with fasteners. There is a window in the VES to permit visual inspection of the condition of the media surface. One section near the access ladder is made for easy removal for inspection of the area beneath the screen. All sections may be removed for maintenance operation if required.

If pump loses prime for any reason, let tank fill with pump "off" to displace air, then start pump.

NOTE: IT IS IMPORTANT TO CALIBRATE FLOW METER WITH PUMP AS DESCRIBED ABOVE.

Use the actual info

EXAMPLE OF CALIBRATION

Calculating Total Dynamic Head (TDH) and determining flow from pump performance curve
Using your Vacuum gauge and Pressure gauge from the Mark V gauge bar, calculate your TDH at current operational load. By using the example below, you can determine the flow (GPM) of the pump and can calibrate your flow meter to correspond to your current flow.

Example:

Vacuum Gauge Reading (4 in. Hg) x 1.13 = 4.52

Pressure Gauge Reading (22 psi) x 2.31 = 50.82

To calculate TDH, add the vacuum gauge reading from the pressure gauge reading to determine your TDH.

HEAD LOSS
All models 2.5 psi @ 15 GPM
* Clean filter loss through internal piping and media.

Example:

Pressure Gauge (22 psi) x 2.31 = 50.83

+ Vacuum Gauge (4 in.Hg) x 1.13 = 4.52

= TDH of 55.35

Use the example performance curve below to determine flow (GPM) with calculated TDH. Please notice the blue curve is the installed pump performance line and the red line indicates the TDH and Flow intersection on the performance curve.

Evacuator Feature

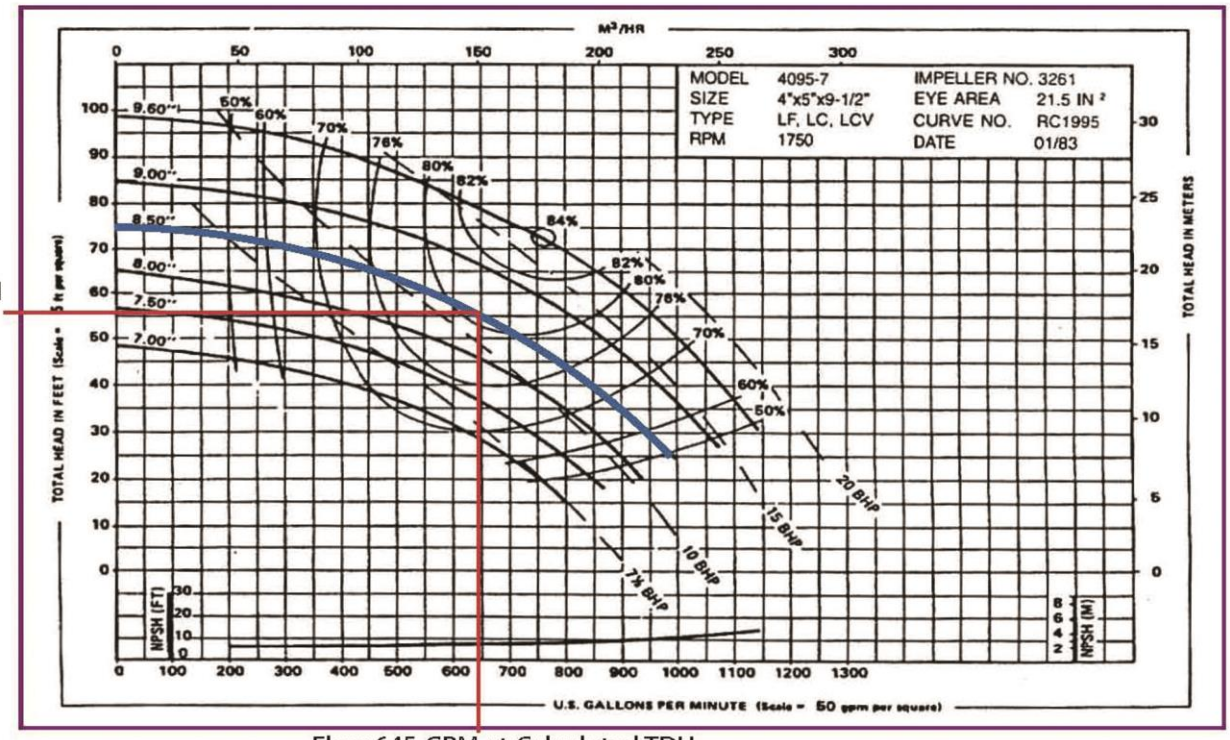
Your filter is equipped with an Evacuator chamber to remove chloramines from the pool water as it is filtered before they can accumulate in the filter room. There is a 4" flanged connection on the side of the tank to which air duct should be connected. This duct should either be tied into the facilities air handling system or routed to a fan (supplied) and vented to atmosphere.

This is not the actual pump curve - EXAMPLE ONLY

PACO PUMPS

LC - 40957 - 1750 RPM - Performance Curve

Project:	Tag #	P.O. #	By:
Location:	Model: **40957**	Cust Ref#	Date: **2/23/2010**
Contractor:	Stages: **1**	Agent/Rep:	Rev. #
Engineer:	Service:	Doc #	Qty:



Calculated TDH
55.35 (TDH)

Flow 645 GPM at Calculated TDH

For further information contact Customer Service below.