yardney
WATER FILTRATION SYSTEMS

Installation and Operation Instruction Manual

INSMAN-205

Industrial RCW Sand Media Single Tank Systems

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INDUSTRIAL SYSTEMS | RCW SAND MEDIA SINGLE TANK

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GENERAL SAFETY GUIDELINES

Please read the entire manual before beginning any procedure.

1. Only properly trained personnel should operate and service the equipment.
2. Always wear proper safety gear when servicing equipment.
3. Before installing the system, ensure that the system falls within the designed operating parameters.
4. Know the safety operating limits of the system and any equipment directly connected to or affected by it.
5. Be sure that the system is depressurized before any maintenance work, removing components or opening of the vessels.
6. Be sure to re-examine the system before putting it back into service.
7. Be sure to maintain all equipment and to continuously check the system for leaks and or damage. Fixing problems as they occur will prolong the life of the system.

The installation and operation of a Yardney RCW cooling tower filter is not complicated. However, it is important for the installer and operator to have certain necessary information to assure that the filter performs the job it was designed to do.

1. LOCATION AND PREPARATION OF THE FILTER SITE

The best location for the filter is adjacent to or as close as possible to the cooling tower sump or water reservoir since excessive distance or elevation could adversely affect the pump's performance. The piping of the water network should however be considered when selecting the site. The following items should also be considered.

a) Level surface.
b) Access for servicing.
c) Provisions for backwash water discharge and drainage.
d) Electrical power for pump and automatic controls.
e) Air supply for valves.
f) Security and safety.
g) Wind drift from tower (filter placement is suggested to be on the "dry" side.)

The foundation or support for the filter should be level and the weight of the equipment, when filled with water should be considered. The approximate total filled weights are shown in the following table.

MODEL NUMBER	APPROXIMATE OPERATIONAL WEIGHT
RCW 1424-1A	710 LBS
RCW 1824-1A	970 LBS
RCW 2424-1A	1,470 LBS
RCW 3024-1A	2,220 LBS
RCW 3624-1A	3,070 LBS
RCW 4824-1A	6,000 LBS

TABLE 1: OPERATIONAL WEIGHTS.

2. ON SITE HANDLING

When the Yardney Filter System arrives at the job site, unloading of the equipment will be required. All Yardney RCW systems are assembled and shipped on a structural steel skid and should only lifted from beneath the skid.
DO NOT LIFT THE SYSTEM BY THE TANK OR MANIFOLDS!!

3. INSTALLATION

Location of the filter should be as close to the sump, water basin as possible. If the filter is installed above the water level a check valve should be used and installed at the lowest point in the suction line. When the filter system suction line is installed below the water line (flooded suction) a check valve may not be necessary.

Location of the suction and return piping in the water basin is important. Care should be taken to insure that the piping follows the natural flow of the system (see figure 1, page 5.)

The filter pump inlet, outlet, and backwash line connection sizes can be found in Chart A below.

Suction piping from the basin to pump suction should be a minimum of 1-1/2 times larger than the pump suction size and should be free from air leaks, sharp curves and loose connections to eliminate the formation of air pockets.

SPECIAL NOTE: If the suction lift is greater than 6' – 8' the standard RCW system may not perform as designed. Optional larger pumps are available to resolve this problem. Consult your local distributor for recommendations.

The backwash piping should discharge into a floor drain, sump or other atmospheric discharge point, and should not be connected directly to a pressurized line.

CHART A

FILTER MODEL	FLOW GPM	SURFACE AREA FT^2	OPERATING PRESSURE PSI	BACKWASH FLOW GPM	PUMP INLET (IN)	PUMP HP	BACKWASH & OUTLET (IN)
RCW 1424-1A	22	1.1	100	16	1 ¼	0.5	2
RCW 1824-1A	36	1.8	100	27	1 ¼	1.0	2
RCW 2424-1A	62	3.1	100	47	1 ½	1.5	2
RCW 3024-1A	100	4.9	100	74	2	3.0	3
RCW 3624-1A	142	7.1	100	106	3	3.0	3
RCW 4824-1A	250	12.5	80	188	3	5.0	4

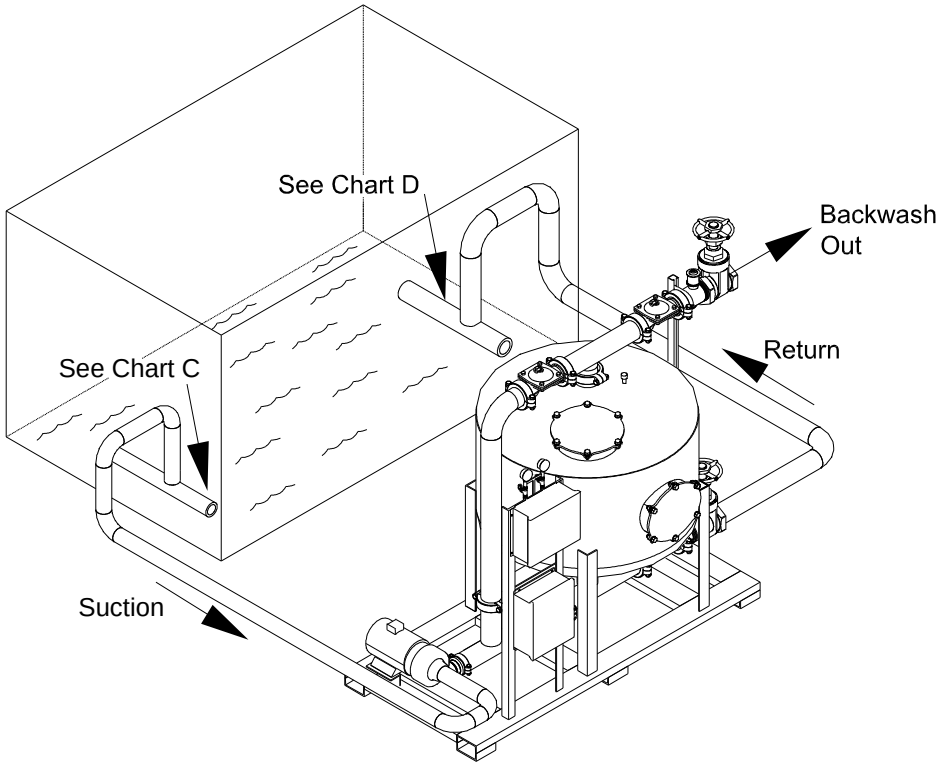


FIGURE 1: TYPICAL PIPING LAYOUT.

PLEASE REVIEW CHARTS "C" AND "D" TO INSURE CORRECT PIPING SIZE AND LOCATION.

The suction piping should be installed to follow the natural flow of the tower system. If a central sump or depression is the lowest point in the tower system, the perforated section of the suction piping should be installed there. If the suction piping is installed with sections higher than the filter, an air vent will be required to vent air from the system at "Start-up" (see Chart B.)

The return piping should be installed with holes directly slightly toward the tower base as shown in Chart C. An adjustable union or threaded joint may help in "aiming" the angle of the return nozzles. The suction return and drain piping should be installed in a size to correspond with the inlet and outlet sizes of the filter. These are as follows:

CHART B

FILTER MODEL	MAXIMUM FLOW	PIPE SIZE (INCHES)		
		SUCTION	RETURN	BACKWASH
RCW 1424-1A	22 GPM	2.0	2.0	2.0
RCW 1824-1A	36 GPM	2.0	2.0	2.0
RCW 2424-1A	62 GPM	2.0	2.0	2.0
RCW 3024-1A	100 GPM	3.0	3.0	3.0
RCW 3624-1A	142 GPM	3.0	3.0	3.0
RCW 4824-1A	250 GPM	4.0	4.0	4.0

CHART C

SUCTION PIPING - NUMBER OF HOLES EQUALLY SPACED						
FILTER MODEL	HOLE DIAMETER (INCHES)					
	1/4	5/16	3/8	7/16	1/2	9/16
RCW 1424-1A	15	10	7	-	-	-
RCW 1824-1A	19	13	10	-	-	-
RCW 2424-1A	36	25	17	-	-	-
RCW 3024-1A	62	41	28	-	-	
RCW 3624-1A	146	91	47	37	29	20
RCW 4824-1A	166	109	77	77	51	34

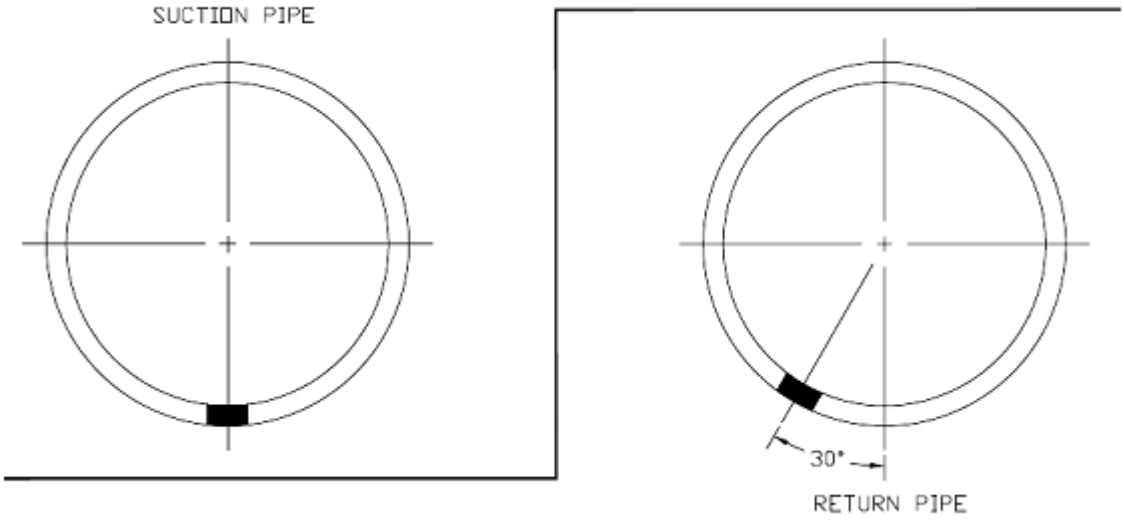
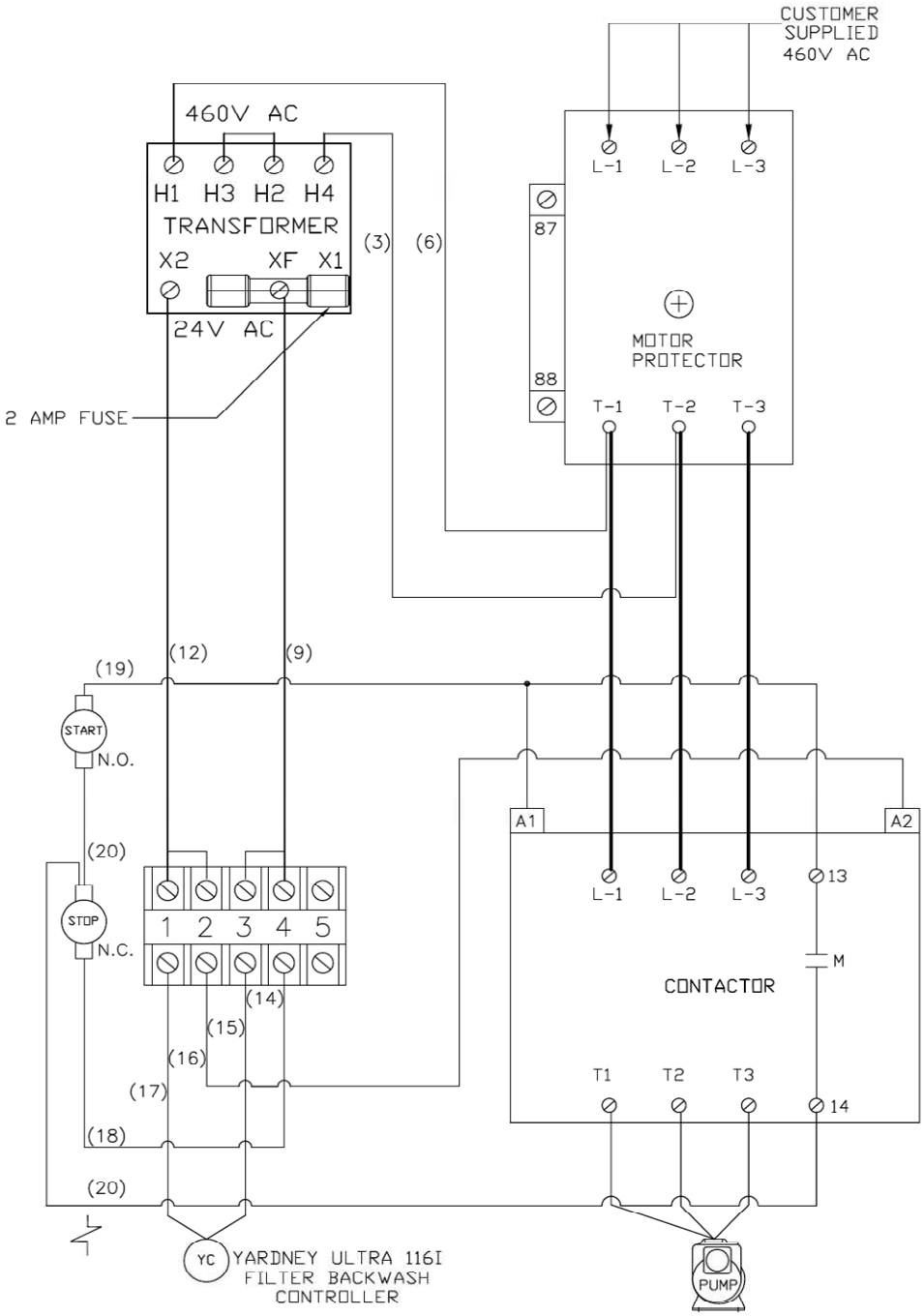


CHART D

RETURN PIPING - NUMBER OF HOLES EQUALLY SPACED						
FILTER MODEL	HOLE DIAMETER (INCHES)					
	1/4	5/16	3/8	7/16	1/2	9/16
RCW 1424-1A	14	9	7	-	-	-
RCW 1824-1A	16	11	9	-	-	-
RCW 2424-1A	29	19	14	-	-	-
RCW 3024-1A	50	34	21	17	13	-
RCW 3624-1A	116	74	39	30	27	25
RCW 4824-1A	160	102	56	44	32	27

4. ELECTRICAL REQUIREMENTS



RCW MOTOR STARTER FEARTURES:

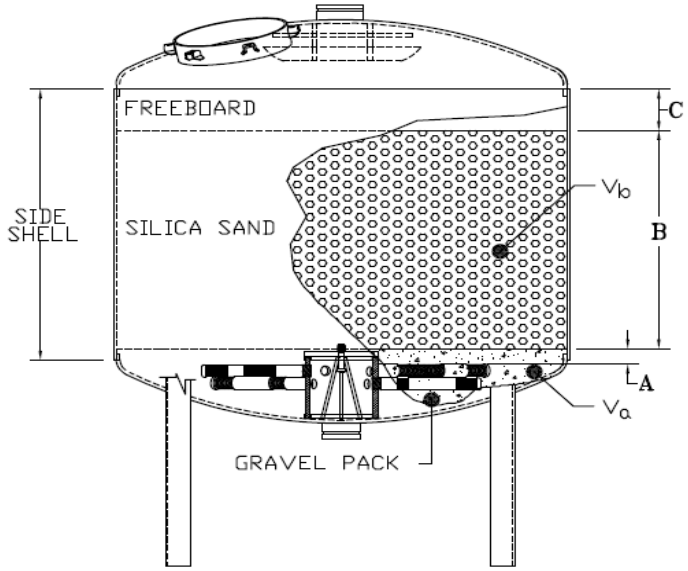
- 3 Phase 460 VAC (supplied by user)
- Motor protector
- Contactor
- Transformer
- All above items are mounted in a NEMA 4X enclosure
- Pre-wired components
- Rotary disconnect
- On/Off push button controls for pump operation
- Motor protectors and contactors are specifically sized for each system motor
- Step-Down transformer provides 24 VAC power to the backwash controller

5. FILTER MEDIA INSTALLATION

THE FILTER GRAVEL PACK MATERIAL MUST BE THOROUGHLY WASHED BEFORE LOADING INTO THE FILTERS. FAILURE TO DO SO COULD RESULT IN PLUGGING OF THE UNDERDRAIN SYSTEM.

Prior to loading the media into the filters, remove the top manway access cover and check the inside of the filter for any foreign material. If any foreign material is found, remove at this time. Two types of media are supplied with the RCW Filter system, ½" to ¾" crushed rock and S47 (.47mm) crushed Silica Sand. The ½" to ¾" crushed rock is loaded first and serves two purposes. It provides the support base for Silica Sand and provides for uniform distribution of water during back-flushing. **The ½" to ¾" crushed rock is shipped in ¾ cubic ft. bags and must be washed before installation.**

After the ½" to ¾" washed, crushed gravel is loaded and leveled, the Silica Sand can be loaded. The Silica Sand is shipped in one cubic ft. bags. The required quantities for both crushed rock and Silica Sand can be found in the following chart and diagram. **Use only Yardney media to comply with warranty.**



24" DEEP BED SIDESHELL					
FILTER DIAMETER (INCHES)	1/2" TO 3/4" CRUSHED ROCK		MEDIA		C
	A (INCHES)	Va (CUBIC FT.)	B (INCHES)	Vb (CUBIC FT.)	INCHES
14	2	0.5	17.0	1.5	3
18	2	1.0	17.0	2.5	3
24	2	1.5	17.5	4.5	3
30	2	2.5	17.5	7.0	3
36	2	4.0	17.0	10.0	3
48	2	7.0	20.0	21.0	3

TABLE 2: MEDIA LOADING TABLE; ALL DIMENSIONS AND VOLUMES ARE APPROXIMATE.

6. BACKWASH VALVE AIR SUPPLY

The RCW filters are designed to use air pressure for back-flush valve actuation. The air supply should be clean and dry, 50 PSI, 2 SCFM. A pressure regulator and gauge assembly should be used prior to connecting the pneumatic supply to the solenoid valves. Once the system has been put on-line the air supply can be regulated for proper back-flush valve opening. The backwash valves should open into the back-flush position with minimal noise or hammer. The regulator must be set to supply a minimum pressure equal to that of the operating pressure of the filter system. Adjust the pressure required for smooth valve operation.

7. INSTALLATION OF BACKWASH LINE PIPING

The RCW Series Media Filter backwash line connection should be the same size as shown in Chart B (pg. 5.) The backwash line piping should discharge to a drain. If it is necessary to run backwashing line pipe a long distance to a drain, allowance should be made in the size of pipe to handle total backwash flow without any restrictions.

WARNING: RESTRICTION OF BACKWASH FLOW FROM FILTER TO THE DRAIN COULD HAVE AN ADVERSE EFFECT ON THE OVERALL BACK-FLUSHING CAPABILITY AND COULD LEAD TO INADEQUATE CLEANING OF THE FILTER DURING THE BACKWASH CYCLE.

8. OPERATION OF THE AUTOMATIC CONTROLS

This Yardney Sand-Media Filter is equipped with a Yardney Synergy solid-state controller. The controller requires 115 VAC power input to the controller and provides 24 VAC output to activate standard 24 VAC solenoids on the filter valves. (Instructions for the Yardney Synergy controller are included inside the locked controller box.) Please see the Synergy Quick Start Guide for basic operations and navigation through the menu map.

9. INITIAL SETTINGS FOR THE AUTOMATIC CONTROLS

9.1 Periodic Flush: During start-up, the filters should be backflushed every two hours. After observing how quickly the filters load up, the interval between backflushes can be increased to as long as once every 24 hours depending on the amount of contaminant accumulation. Backflushing is recommended when the filter shows a 10-PSI (net of clean filter differential pressure) pressure differential between the inlet and outlet pressure gauges.

9.2 Flush Duration: During start-up and initial operation, the backflush duration should be set for 2-1/2 to 3 minutes. The minimum backwash duration should be set at 2 minutes.

9.3 Delay: The dwell should be adjusted to allow an overlapping of the backwash valves. The next valve in sequence should start to open a few seconds before the preceding valve closes. If the valve shuts off completely prior to the opening of the next valve, water hammer may occur.

9.4 Pressure Differential Switch: The PD switch is field adjustable by loosening the screws on switch and slide it to adjust set point.

EXAMPLE: If the clean filter pressure differential is 6 lbs then adjust pressure differential switch to 16 lbs.

10. DIAPHRAGM VALVES

The RCW series sand media filter utilizes four (4) air activated (standard) or hydraulically activated (optional) diaphragm valves for routing of water during filtration and backwash. The standard system is designed to use air pressure to activate the four (4) valves. The air supply to the valves should be a minimum of **40 PSI** and a pressure regulator and gauge assembly should be used prior to connecting the air supply to the solenoid valves.

NOTE: On systems that are supplied with hydraulically actuated valves see page 12.

Air supply must be maintained at all times when the filter is in operation. The backwash "IN" and backwash "OUT" valves require a continuous supply of air to maintain the closed position. If air supply fails, the backwash "IN" and backwash "OUT" valves will revert to the open position.

When the filter is in the **filtration cycle**, the valve position is as follows:

Inlet	open
Outlet	open
Backwash In	closed
Backwash Out	closed

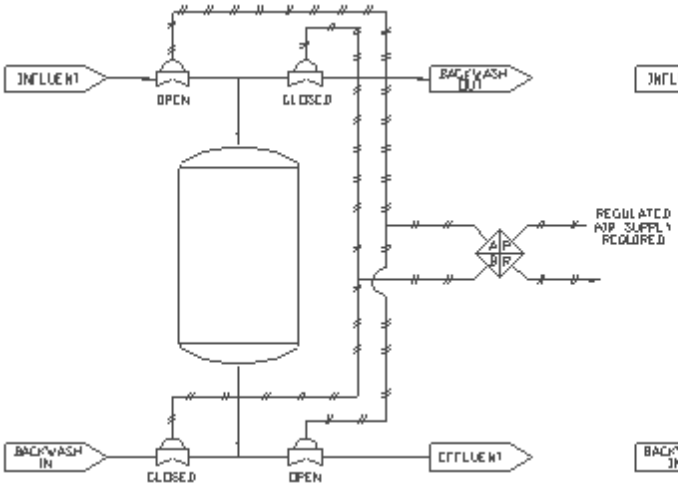
When the filter is in the **backwash cycle** the valve position is as follows:

Inlet	closed
Outlet	closed
Backwash In	open
Backwash Out	open

When the backwash cycle has been completed, the valves will automatically revert back to the position for the filtering cycle.

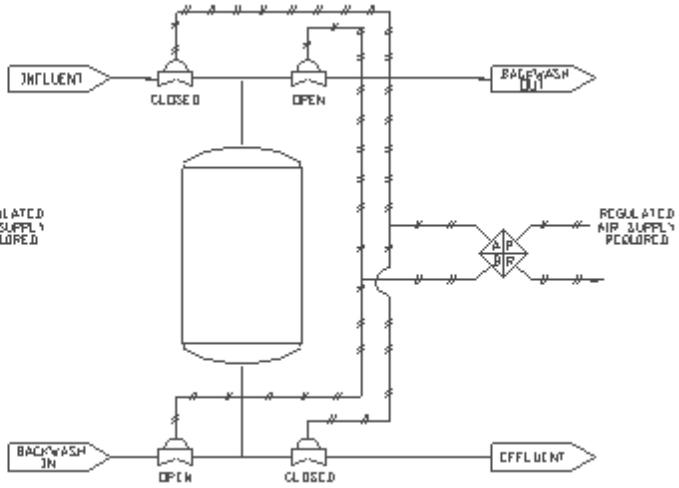
FILTRATION

AIR ACTUATED VALVES



BACKWASH

AIR ACTUATED VALVES



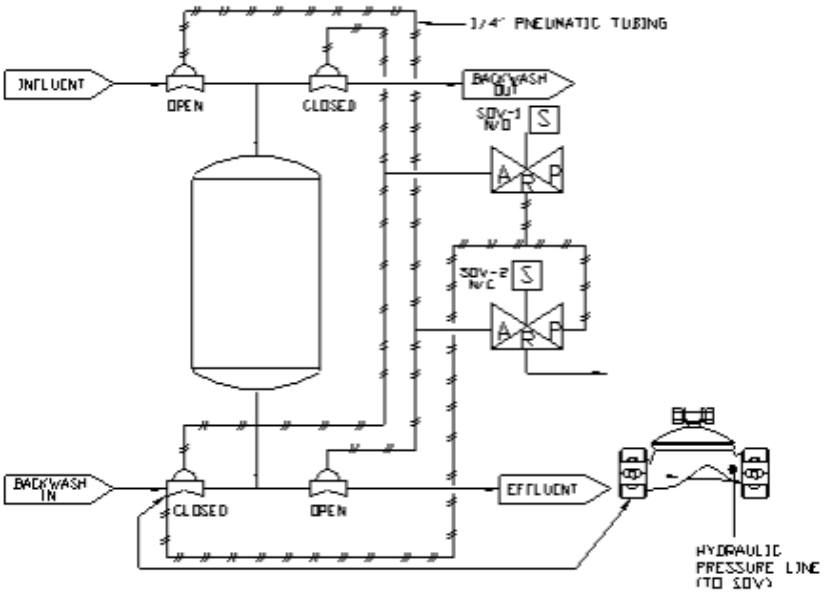
AIR POWERED VALVES -- STANDARD

The air supply to operate the valves is connected to the pressure port of the lower solenoid valve mounted on the backwash controller. The lower solenoid valve, which is normally closed, supplies the pressure to the influent and effluent valves. The upper solenoid valve, which is normally open, supplies pressure to the backwash "IN" and backwash "OUT" valves.

When the backwash cycle is initiated both solenoids are energized simultaneously changing the direction of airflow to the valves.

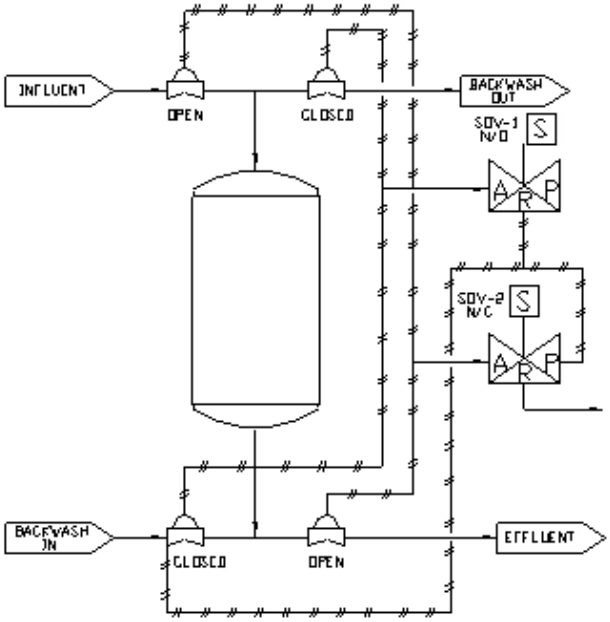
FILTRATION

HYDRAULICALLY ACTUATED VALVES



BACKWASH

HYDRAULICALLY ACTUATED VALVES



WATER POWERED VALVES -- OPTIONAL

The hydraulic pressure supply, used to operate the valves, is sourced from the normally closed valve on the backwash source of the filter. This supply is filtered through a small strainer inserted in the valve. The strainer should be cleaned during normal maintenance to remove any build-up of foreign material.

11. INITIAL START-UP PROCEDURE

Following installation, the following start-up procedure will bring the filter online.

11.1 Check all pipe connections for leaks.

11.2 Check all electrical connections to backwash controller and pump. Refer to **Page 7** of this manual for wiring diagram.

11.3 Check rotation of the pump. It should turn clockwise while facing the pump motor.

11.4 Make sure the pump and suction line are primed. Remove the ¼" pipe plug from top of pump housing and fill with water. Replace plug and start the pump. A foot valve may be required to maintain prime.

Once the above procedure has been completed, the filter is ready to go online.

NOTE: Flooded suction on the pump must be maintained at all times. Suction piping should be free from air leaks, sharp curves, and loose connections to eliminate the formation of air pockets. Suction piping from water basin to pump inlet should be a minimum of 1-1/2 times larger than the pump inlet size.

11.5 **Discharge Flow Adjustment**: The RCW series filter is supplied with a gate valve on the filter system discharge pipe to adjust system flow and pressure. It will be necessary to make this adjustment during start-up.

Installation of a flow meter on the discharge side of the filter will allow a visual indication of total flow but is not absolutely necessary. Correct flow may be attained by opening or closing the discharge valve until the correct operating pressure is reached. Once the correct operating pressure has been reached, it is advisable to remove or lock the valve handle to avoid inadvertent adjustment of the valve by others.

12. THE BACKWASH FUNCTION

Backwashing the filter is the process by which clean water flows upward through the bed, lifting and expanding the media, allowing it to release the collected contaminant. The contaminant is then carried away with the backwash water. Excessive backwash flow will expand the media to the point that the media itself is expelled out of the tank. Insufficient backwash flow will not expand the media enough to purge out all the entrapped contaminant. This could result in a residual pressure loss through the filter bed, even after backwash. **To achieve maximum filter performance, the backwash flow must be properly adjusted.**

12.1 Prior to adjustment, the filter must be ran for a few minutes to fill the system to the designed pressure and flow. The system discharge flow control valve should be adjusted prior to making any backwash flow adjustment.

12.2 Open the backwash control gate valve approximately one turn.

12.3 Press the start button on the controller. This will put the filter into a backwash cycle for the length of time set on the duration window. This sequence may have to be done more than once to provide enough time for proper backwash adjustments.

12.4 Monitor the content of the backwash water with a screen, mesh cloth, your hand or other sampling device. Gradually open the backwash flow control valve until a small amount of media from the backwash water appears in the flow.

12.5 When media begins to show in the backwash water, gradually close the backwash flow control valve until the water is essentially clear of media. A trace of media is acceptable since it is desirable that the lighter granules (fines) in the media bed be allowed to wash out. After adjustment of the backwash flow control valve, the handle should be covered or removed to avoid tampering. (NOTE: if at a later time any significant changes are made in pressure or flow, the above adjustments should be checked.) The filters are now adjusted for backwash and the controller time interval between flush cycles should be set to flush when the pressure differential reaches 10 PSI.

13. PRESSURE DIFFERENTIAL

A pressure differential switch is connected electrically to the controller terminals marked “pressure sensor.” When the pressure drop reaches the setting on the gauge, the switch will override the “interval hour” setting and initiate a flush cycle. This is to protect the system from unusual surges of particulate in the water. A flush cycle initiated by the pressure differential switch is treated like a regular flush cycle and will zero the interval time elapsed so that the correct interval setting will govern the next flush cycle.

EXAMPLE: If the interval setting is for 12 hours and the PD switch initiates a flush cycle 6 hours into this setting, the next scheduled flush cycle will be 12 hours later.

14. “BLOWDOWN WATER” ADJUSTMENT

After the Yardney RCW is started up, has operated for a few days, and has removed residual basin contamination, the cooling tower "blowdown rate" should be able to be reduced 40%-60% (depending upon your specific operating conditions). Chemical feed rates should also be reduced to lower levels, consistent with the reduction in the blowdown rate.

REFERENCE | OPERATING TROUBLESHOOTING GUIDE

A. POOR FILTRATION

PROBABLE CAUSE	SOLUTION
Wrong media.	Addition of correct media or media replacement.
High-pressure differential forcing contaminants.	More frequent backwashes and/or readjustment of the backwash control valve.
Filter media low causing contaminants to pass through.	Addition of media to the correct level.

B. CONSTANT HIGH PRESSURE DIFFERENTIAL

PROBABLE CAUSE	SOLUTION
Filter sealed over -- not enough water available through filter for backwash.	Removal of covers and removal of the top layer of dirt from filter media. Replace covers and flush tanks for short intervals until clean. Readjust the backwash flow control valve.
Insufficient backwash flow.	**Readjust the backwash control valve. (Section 12 on page 14 System Start-Up)**.
Fouled underdrain	Remove Media - Clean underdrain

C. BACKWASH VALVE LEAKAGE CAUSE

PROBABLE CAUSE	SOLUTION
Obstruction in the valve seat area.	Remove obstruction.
Valve seat element worn.	Replace.

D. AIR HAMMER

PROBABLE CAUSE	SOLUTION
Backwash line causing vacuum.	Install a vacuum breaker on the backwash manifold.

E. FREQUENCY OF BACKFLUSH INCREASING

PROBABLE CAUSE	SOLUTION
Improper backwash flow rate or improper duration of backflush.	Increase backwash flow rate and/or the length of backflush time.
Low filter bed.	Addition of media to the correct level.
Dirtier water.	Greater filter capacity required.