

**PUREFLOWSM
PF-16 COLUMNS**

GUIDE TO

INSTALLATION AND REPLACEMENT

&

RECOGNIZING SYSTEM CONDITIONS

**ECS Refining
705 Reed Street
Santa Clara, CA 95054**

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Introduction:

This guide has two parts: the installation and replacement directions and an introduction to column systems and column shape changes in response to pressure. The installation and replacement directions provide the best and fastest current methods to replace PF-16 columns. The introduction to column systems and the different column shapes will help the PF-16 column customer differentiate problems with pumps, tubing, and PF-16 columns. The method is to examine the shape of the PF-16 columns to determine column system performance.

Installation and Replacement of



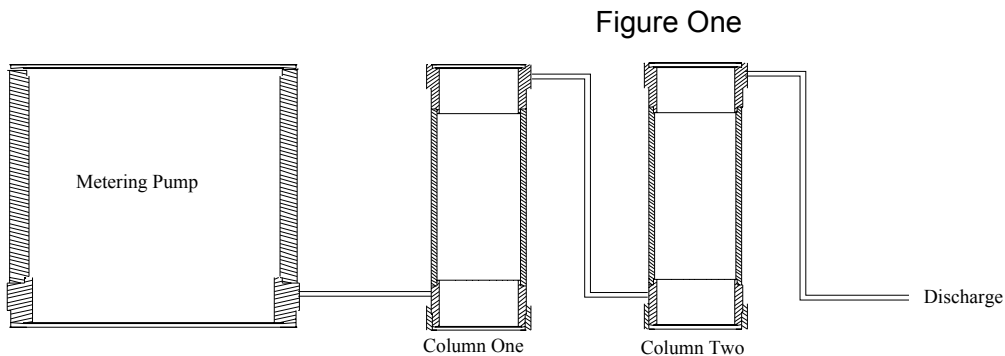
AGgressive in Recovery

Silver Recovery Columns

Your new *Pureflow* column represents the latest in column technology. It is designed for high capacity, ultra-low silver discharge and ease-of-use. This makes *Pureflow* columns the best in their class. Canadus/ECS Refining is proud to offer a product that will provide convenient and dependable service.

SETUP:

It is important that your column system is setup properly. Failure to properly setup your *Pureflow* silver treatment system may cause poor results or equipment failure. Figure One shows the proper setup for *Pureflow* columns; two *Pureflow* columns connected in series to a metering station.



For maximum effectiveness, the Metering Pump is calibrated to 1.0 gallons per hour (66 ml/min.) or less. Higher flow rates may reduce effectiveness, cause an increase in discharge silver concentrations, and over pressure the Columns. To prevent over pressurization of the columns, a pressure actuated diverter valve set to open at a pressure between 17 & 20 psig, should be installed in the tubing between the pump and the first *Pureflow* column. The discharge from the diversion outlet of the valve should be directed to the pump station reservoir.

NEW INSTALLATIONS¹:

Before operating the *Pureflow* silver treatment system, assembly is required. Each column has an input $\frac{1}{2}$ " NPT female thread near the bottom of the column and an output $\frac{1}{2}$ " NPT female thread at the top of the column.

- The two barbed $\frac{1}{2}$ " NPT male connectors need to be connected to both NPT female threads (be sure to use Teflon tape).
- Once the columns have connectors, they need to be attached to the metering pump using $\frac{5}{8}$ " tubing.

¹ Use new tubing, connectors, valves, and fittings for installation and replacement of columns;

- Start by connecting the tubing from the Metering Pump to the ½” NPT male connection near the bottom of the first column, Column One (with a hose clamp).
- 5/8” Tubing should be connected to the exit at the top of Column One (the top is labeled “OUT”) and then connected to the second column (Column Two) near the bottom (use hose clamps).
- 5/8” Tubing should be connected to the exit at the top of Column two (the top is labeled “OUT”) and then connected to the drain for discharge to the local sewer.
- The Metering Pump may now be turned on.

REPLACEMENT INSTALLATIONS:

Replacing a column in an existing system is the most common column operation. Once it is determined that a column needs to be replaced, **ONLY COLUMN ONE IS REPLACED**. Column One is the column directly connected to the Metering Pump.

REMOVE COLUMN ONE

- To change this column, the connectors need to be removed.
- **TURN OFF the Metering Pump**, then start by removing the top tubing (undo the hose clamp) and connector on Column One. Perform this operation carefully to avoid spilling photochemical solution. Crimping the tubing and attaching the ½ inch NPT plug as soon as possible will minimize spillage.
- Once the top plug is attached, repeat for the bottom fitting.

RINSE COLUMN ONE

- Pump water through the column that has been removed, collecting the rinse water and processing it through the silver recovery system after the column change has been completed. The column must be flushed at least three times to comply with environmental regulations.
- Column One is now ready to ship to ECS Refining. Put the column into the plastic bag, seal and send to:

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Santa Clara, CA 95050

The remaining column, Column Two, is now moved into the Column One position – directly connected to the Metering Pump. This is done as follows:

MOVE COLUMN TWO INTO THE COLUMN ONE POSITION

- Remove discharge tubing (see Figure One) from Column Two (tubing only, leave NPT fitting in place)
- Physically move Column Two into the same position as Column One
- Prepare to remove tubing from the bottom of the column and quickly replace it with the tubing from the Metering Pump. Only loosen the hose clamp on Column Two before placing the tubing from the Metering Pump near the bottom fitting on Column two. With a single motion, pull the tubing off of Column Two and replace it with the tubing from the Metering Pump. Tighten the hose clamp and Column Two is now Column One. Take the tubing just removed and connect it to the top of the new Column One. You are now ready to add a new Column Two.

Once Column Two is moved onto the Column One position, the new column is attached at the end of the Silver Treatment System. The new column will be Column Two.

ADD A NEW COLUMN TWO

- To attach the new column, take the two barbed ½ “ NPT male connectors from the “old column” and connect to both NPT female threads (be sure to use Teflon tape).
- The tubing connected to the exit at the top of Column One (the top is labeled “OUT”) is then connected to the second column (Column Two) near the bottom (use hose clamps).
- Tubing should be connected to the exit at the top of Column Two (the top is labeled “OUT”) and then connected to the drain for discharge to the local sewer (see Figure One).

Column replacement is now finished and the Metering Pump can be returned to service.

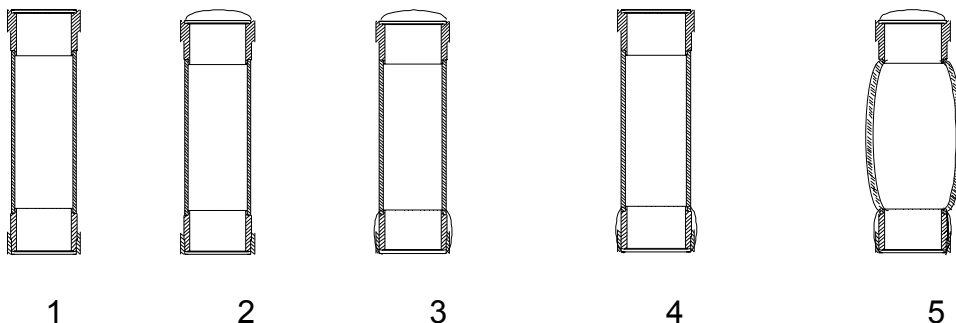
Recognizing System Conditions from Column Shapes

Introduction:

The shape of the Pureflow PF-16 columns you encounter provide information about the pressures the columns are experiencing. From pressure information, the functioning of the pump station, the tubing, and the columns can be inferred. The columns bulge in three areas in response to pressure:

- The Top (@~10 psi)
- The Bottom (@12-15 psi)
- The Side. (> 15 psi)

Column Shapes:



There are five basic column shapes (bulges are exaggerated for purposes of clarity):

1. No Pressure Shape (<10 PSI)
2. Low Pressure Shape (~10 psi) top bulge
3. Full Pressure Shape (~12-15 psi) top and bottom bulge
4. Full pressure shape (~12 – 15 psi) bottom bulge
5. Over pressure shape (>15 psi) top, bottom, and side bulge

The columns in the system experience the pump pressure differently. Column one is directly connected to the pump and is normally subjected to higher pressures. Thus, column shapes 1, 2, 3, and 4 can be normal for column one. Only column shape 5 indicates a problem for column one. The normal shapes for column two include 1 and 4 only. Column shapes 2, 3, and 5 indicates a problem for column two.

When viewing the columns, the PF-16 column customer should look at column one and column two differently. The general rule is that column one can bulge from the top and bottom, but column two can only bulge from the bottom. Under these conditions, the columns are experiencing normal pressures from the pump. No action is necessary if the high pressure alarm is silent and the feed tank volume is normal.

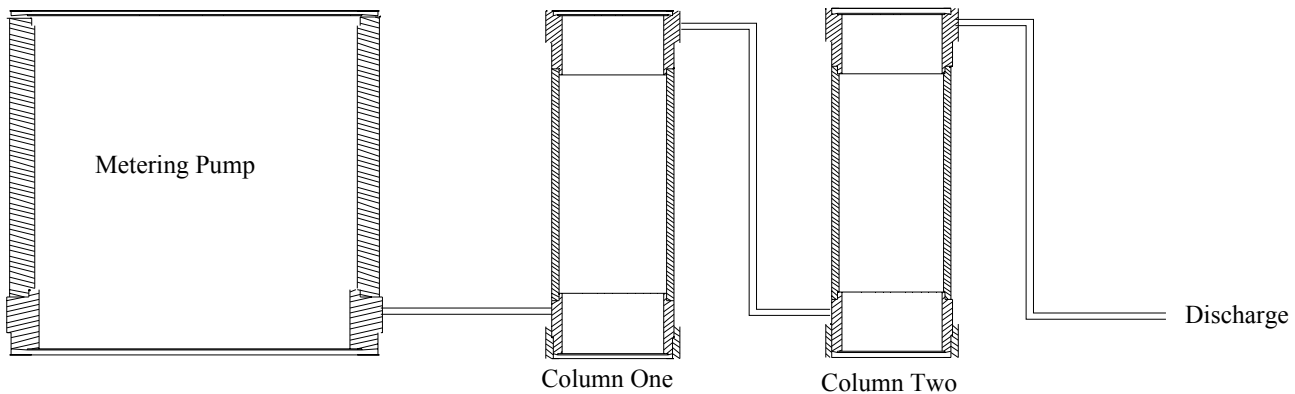
Defining problems with column systems can be tricky. A fully defined guide to all possible problems is outside the scope of this work. However, some of the most common problems the

PF-16 column customers have reported to ECS Refining can be listed with the most common cause.

Typical Problem:	Common Cause:
1) High Feed Tank Level Alarm Both Columns have shape 1	Pump Service Needed
2) High Feed Tank Level Alarm Column One shape is either 2 or 3 Column Two shape is either 2 or 3	Discharge Tubing Clogged
3) High Pressure Alarm Column One shape is 5 Column Two shape is 5	Discharge Tubing Clogged Columns need replacement
4) Solution Leak into Secondary Both Columns have shape 1	Pump Service Needed Feed Tank Overflow

As a further guide to the PF-16 column customer, the following six system conditions are presented. These system conditions represent all known common system conditions.

Figure 1.

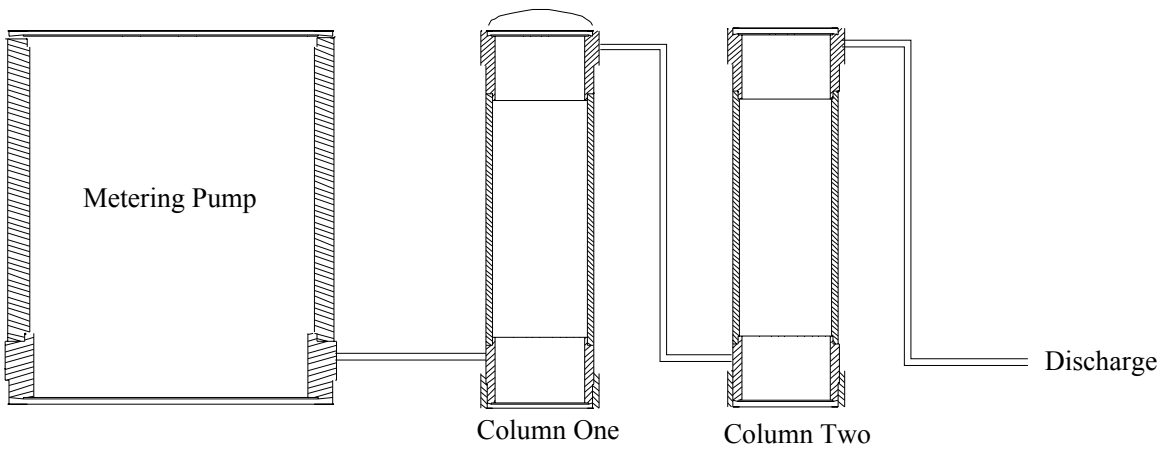


This is the first system condition; the columns are under low pressure. This condition occurs when:

- The pump is off (low liquid level, no power, pump failure)
- The pump is on and working properly, and the columns are new (solution is being discharged normally).
- The pump is on but not working properly and the feed tank solution level is high (pump head service needed).

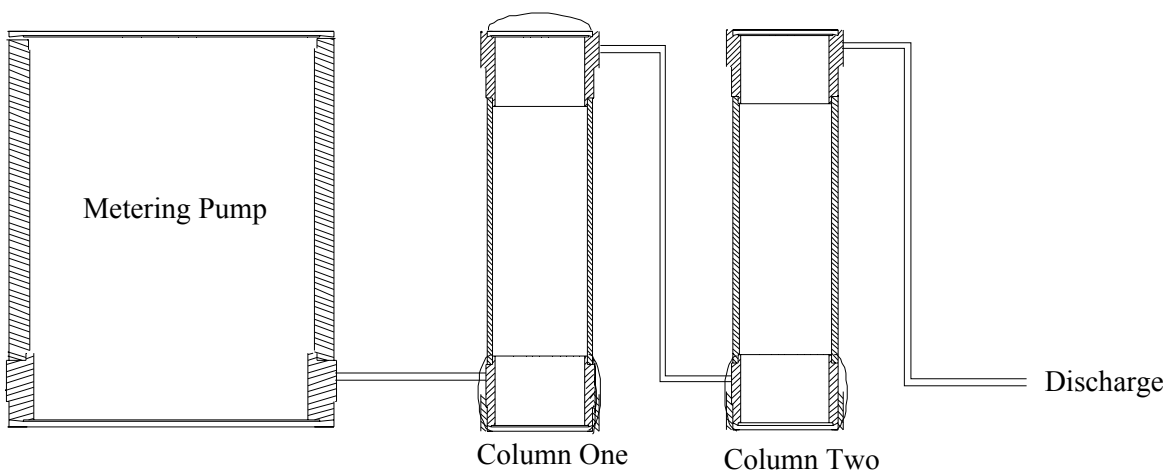
This is a common condition and may not indicate a problem. The feed tank solution volume should be low and the float level should be off.

Figure 2.



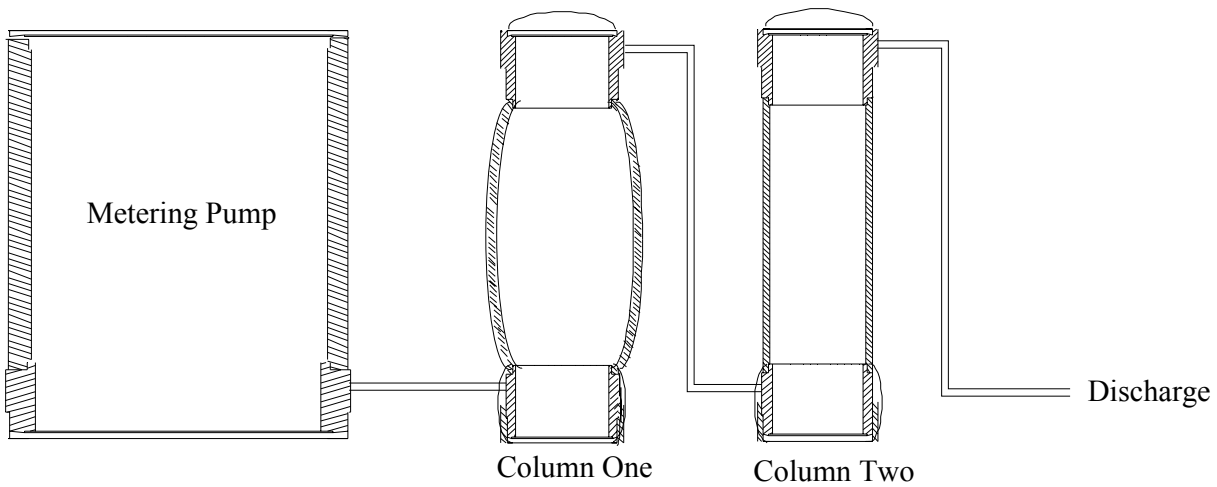
This is the second system condition; the columns are under normal pressure condition, but at the lower pressure range (~10 psi). Note that column one has a slight bulge at the top (but not column two). This is a common condition and if the feed tank solution level is below high level, no action is needed.

Figure 3.



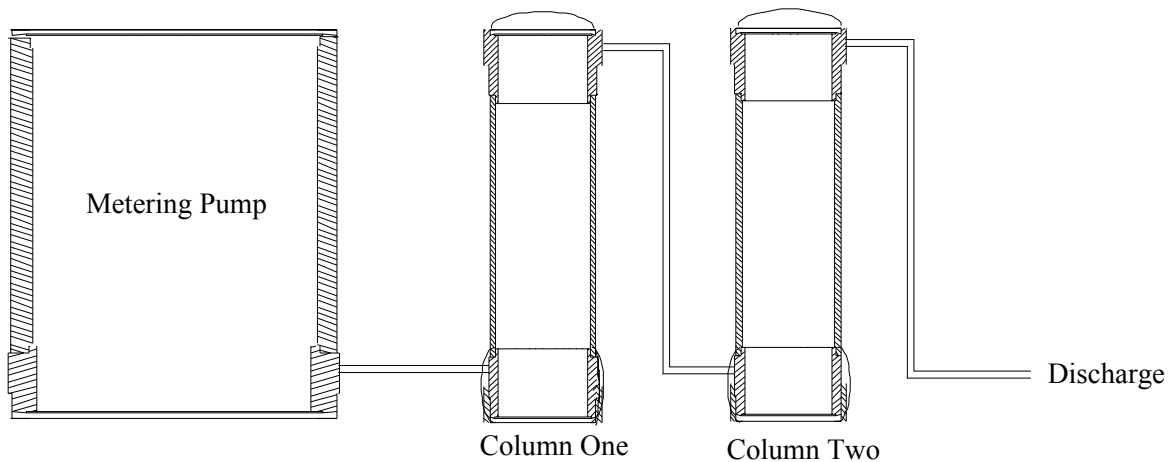
This is the third system condition, the columns are under normal pressure, but at full pressure (~12-15 psi). This condition is normal if the high pressure alarm is not on and the feed tank solution level is below high level; no action is needed. Note that the top and bottom of column one may have a slight bulge and the bottom of column two may have a slight bulge.

Figure 4



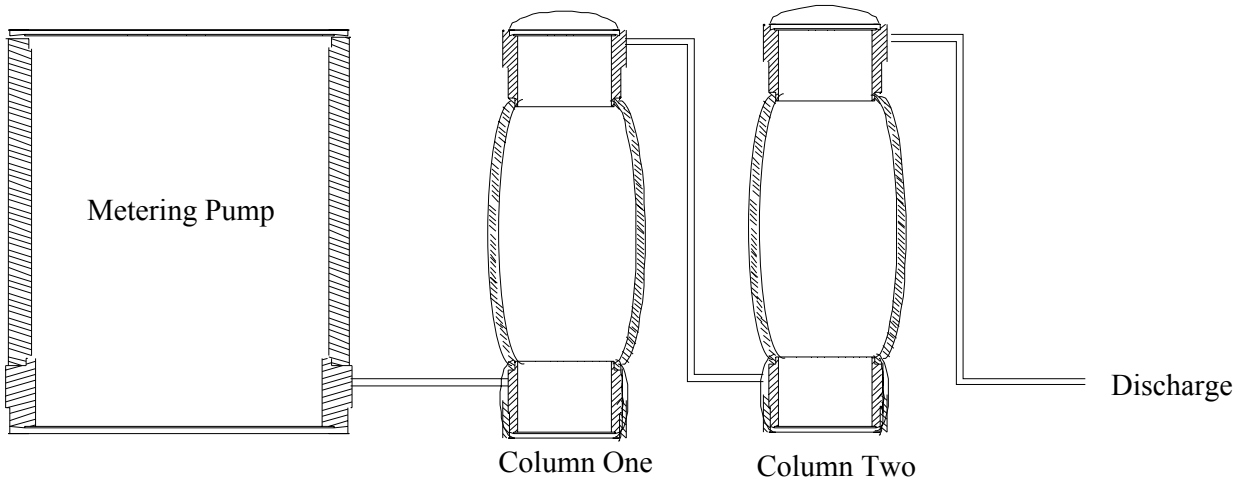
This is the fourth system condition; this is a high pressure condition with column one damage. This condition shows column one with a bulge at the top, the bottom, and the side of the column. This is a high pressure condition and the high pressure alarm will likely be active. It is likely column one needs to be replaced (call to order). Column two may be operated as a single column until the replacement column arrives. The PF-16 column customer unfamiliar with this situation may wish to call ECS at (408) 988-4386.

Figure 5.



This is the fifth system condition; it is a high pressure problem condition with no column damage, but clogged discharge tubing. This condition shows column one with a bulge at the top and the bottom. It also shows column two with a bulge at the top and bottom of the column. This is a clogged discharge tubing condition and the discharge tubing either needs to be changed or cleaned. In this case, both column one and column two are undamaged. The PF-16 column customer unfamiliar with this situation may wish to call ECS at (408) 988-4386.

Figure 6.



This is the sixth system condition; it is a high pressure problem condition. This condition shows column one with a bulge at the top, the bottom, and the side of the column. It also shows column two with a bulge at the top and the bottom of the column. This is a clogged discharge tubing condition and the discharge tubing either needs to be changed or cleaned. The PF-16 column customer needs to call ECS at (408) 988-4386.