TROUBLE SHOOTING FILTERS IN PLATING SHOP

Most of the problems occurs with precoat filters on plating solution. They are clarity, cycle time and flow rates. Two types of filters we will look at, they are horizontal plate and vertical leaf units.

The horizontal plate filter is suited for plating solutions. The pump can be stopped and started without dropping the cake which does the actual filtration. The filter media is a replaceable paper. The paper holds the diatomaceous earth, or cellulose precoat plus the carbon, if used. Materials of construction carbon steel , rubber lined or plastic.

CLARITY

Clarity problems are caused by items like the wrong paper is being used. The filter manufactures will supply paper with their filters. This is the paper you should use. People will come in and say they can save you money but if you have clarity problems it will cost you more in the long run to correct the problem.

Other problem, some one did not put paper on all the plates , or the paper is misaligned on the plates. The paper can be wrinkled or bent at the edge of the plate or in the center area . The plates are not sealed in the bottom of the vessel. The bottom gasket is bad or gasket was not put in place. The center tie rod was not

tightened properly. You can ripe the paper, if during the filling of the filter, you do not have the outlet open to the precoat tank. Air will get trapped under the paper as soon as the paper gets wet it will rip. This will be about half way up the stack of plates.

Insufficient amount of precoat. With diatomaceous earth .15 lbs per sq. ft. or 15 lbs/100 sq. ft. Cellulose .06 lbs per sq. ft., or 6 lbs/100 sq. ft. Some people mix cellulose and diatomaceous earth at all different ratio's, just **be sure** you have the proper amount of filter aid, also the proper grade, too course a grade will allow by passing.

If a carbon pack is added, mix diatomaceous earth and the carbon together in the precoat tank 1-to-1 ratio. If you just add carbon on top of the precoat you will experience high pressure drops. The diatomaceous earth keeps the carbon more open to flow.

If you get carbon blead through when on stream, you have a ripped paper, the plate assembly is not secured in the bottom of the filter properly, or the papers are not sealed at the edge or periphery of the plates, or the wrong filter paper is used. The only thing to do is take the filter apart and redress it or put the bag filter on the discharge of the horizontal plate unit.

Pump problems

Cavitation, if the pump is trying to discharge more liquid than it is drawing in, the suction piping to the pump is small or has too many elbows. Foreign materials stuck in the suction piping to the pump, if your listen to the pump it will sound like you are pumping marbles. **Air** is getting into the filter and dropping the level of the liquid below the top of the filter plates. A faulty mechanical seal can suck air into the system. Suction line is to close to air discharge on air agitated baths. A crack in the plastic piping, loose flange, or poorly glued fitting on the suction side of the pump will suck air into the system. Another cause of pumping problems is that the pump is wore out, it should be rebuilt or replaced. DO NOT USE AIR driven diaphragm pumps on horizontal plate filters. The pulsation will cause blead through of diatomaceous earth or solids.

CYCLE TIMES OR LIFE OF THE FILTER

Cycle times can range from eight hours to four weeks typical.

High flow rates or over loading the filter, not enough cake capacity, are problems. Tank turn over rates is not he problem, (4or 6 turns per hour), square feet of filtration area is. High flow rates will kill a filter very quickly. When you operate the filter at lets say, 3 GPM per sq. ft. you are slamming the colloidal solids into the precoat, and your packing the precoat very tight. If you have carbon you will pack the carbon also. When you start a filter throttle down, the discharge valve off the pump or the

discharge valve off the filtrate outlet. ***For example***, you have a nickel bath that you want to filter at a rate of 6000 GPH or 100 GPM, operating at 3 GPM/ft² you will have a 35 sq. ft. filter. My recommendation is to run at about 1 GPM per sq.ft. You would need a 100ft² filter, longer cycle times. If you just add carbon and no diatomaceous earth, you will also effect your cycle time. It has just been recently the last 15 or so years people run the filters at high flow rates I don't think it is worth it.

Everyone has a pressure gauge on the filter when the pressure reaches a certain level, or the flow drops off, something is done such as, "clean the filter" or "add more filter aid" by going back to the precoat cycle, you will operate longer at the pressure you are at, but there will be very little- if any increase in flow. The old precoat is blinding to some extent, and the flow through the blinder media will not increase.

Cake capacity will also effect the life of the filter. Once the cake capacity is filled the flow will drop off. By over loading the filer you can damage the plates. Get the cake capacity of the filter from the filter manufacture in cubic feet, then ***DO NOT EXCEED IT.*** A 50 lb bag of diatomaceous earth is 2½ cu. ft. (20 lbs per cubic feet) A 50 lb bag of carbon is 1.6 cu.ft. (30 lbs per cubic feet). Cellulose is 8-10 lbs per cubic feet, cellulose come in 50-to-40 and 25 pound bags.

Even though we are not discussing cartridge filters their information is given in sq inches of filtration area, not sq. ft. and cubic inches of cake capacity not cubic feet.

There are not a lot of problems with cartridge filters. The maximum flow rates based on water is 5 GPM per 10" length of cartridge. You get the clarity and flow you want. If you don't, change cartridges to what you need. Some manufactures say install a 50 micron cartridge when you want a 10 micron retention. Run at a high flow rate and you will get to the 10 micron retention and better. The only thing is when you first start you are getting 50 micron retention.

VERTICAL TANK VERTICAL LEAF PRECOAT FILTERS

There are a lot of this style filters in service today, materials of construction carbon steel, rubber lined. These filters utilize textile bags, than can be re-used time after time. It is recommended that the bags be changed once a year or when blinded.

There are two styles of this filter, "wet cake discharge" and "dry cake discharge". We will first discuss the wet cake discharge units. The vast majority of vertical tank, vertical leaf filters are wet cake discharge. These filters have vertical leaves, that are top outlet type, textile bag covered, if the textile bags are not put on properly - leakage, passing solids

occurs . Between each of the leaves there is a spacer to allow 1½" spacing between the leaves. At the end of the leaves there is an end cap that a draw rod screws into. This clamps the leaves together. If this assembly is not drawing tight enough, leakage will occur. Also there are two "O" rings that have to be in place or leakage will occur. These filters normally run a week or two before cleaning. Many people pull the leaves out for cleaning. They hose off the cake, check the bags and re-assemble the filter. This is not an easy job. Some of the filters were equipped with an internal air wash cleaning device. At the end of the cycle the heel in the filer is blown out, the unit is filled with water the air wash cleaning device is turned on, air bubbles through the water to dislodge the cake, the water and cake is drained to the waste plant. These filers are normally precoated with cellulose and or diatomaceous earth or both. A lot of people will operate 8-10-12 hours per day. At the end of the day they shut off the pump. If the filer is precoated with diatomaceous earth , some of it will slide off the leaves into the bottom of the filter. In the morning they will put the system into precoat mode and start the pump. Some of the D.E. will be picked up and put back on the cloth bags, but you will also putting solids that you are removing against the bag which can cause blinding. You could also add a small amount of D.E. when you start up, 2 lbs per 100 ft². If the filter is precoated with cellulose, there are two advantages over the D.E.. **FIRST** if there are any small leaks the cellulose will plug them the **SECOND** cellulose is a long type fiber and it will let us say staple into the fabric bag. When you shut down at night, a small amount will fall to the bottom of the filter. No where like D.E.. When you start up in the morning, you can add 2-4 ounces up to 100ft². Cellulose is harder to wash off the bags than D.E. If there is a small amount of oil dragged into the plating solution cellulose will absorb it, 1-to-10 PPM After a while the cellulose will become saturated with oil, the oil will than pass through.

Some people mix cellulose and D.E. together. This keeps a more open path for flow. At higher differential pressure the cellulose will pack or mat and form a heavy layer of paper, the D.E. keeps it more open.

High flow rate, 3 GPM per square foot, will also cause short cycles and high pressure drops. Also will increase the frequency of bag replacement. The solids, D.E., cellulose and carbon will be driven into the bag and not removed when cleaning the bags. The way to tell if the bag is blinding is to remove the leaves with the cake on them, if there are places where cake is not built up, this area is blinded. You can also moderate flow & pressure. This type filter can have the same pump problems as the horizontal plate units, air cavitation, bad seal, rebuild or replace the pump. People have used air driven diaphragm pumps on this style filter. A pulsation dampener should be used to even the flow out.

The next vertical tank vertical leaf unit is the dry cake discharge one. This filter has a pipe or discharge manifold running along the bottom of the filter with holes in which the bottom outlet nozzle from the filter leaf fits into. The holes in the outlet manifold can be placed on from 2-to-4" center lines giving large cake capacity. The leaves again are textile or bag covered. If the bags are not installed correctly you will get leakage. The leaf has a "O" ring on the outlet nozzle that seals in the hole in the outlet manifold. If the "O" ring is not put on , if it is cracked, has a gouge in it and rubber removed, you will get leakage. At the end of the cycle, the nickel is blown out of the filter and air is blown through the cake to dry it. Air required to dry the cake is ½ SCFM per square foot of filtration area, at 40 PSI for 15 minutes. If the required air is not used, the cake will not dry and it will not be vibrated off the leaves as a dry cake . It will be a sloppy mess sliding down the cloth into the container.

If you do not have the proper air SCFM or pressure you can dry the cake longer. Some people say they have to dry it for an hour. This style filter is used on large tanks or carbon treatment of solutions. If the filter is turned off at night and restarted in the morning, you have a much better chance of picking up the filter aid and putting it back on the leaves. But again dirty material against the textile bags. This filter is designed for 24 hour a day operation.

On a horizontal plate filter you discard the paper filter media and cake, every time you clean it. With new filter media each time you have a good idea of cycle time. On the vertical leaf filters with textile bags as time goes on blinding of the bags will occur. There will be a gradual decrease in flow and a gradual increase in pressure at the start of the cycle. It is at times hard to monitor flow. But with one pressure gauge you can tell.

Cover gasket, "O" ring, bottom seals, all elastomer products should be changes once a year. Once you see something leaking, do maintenance and you will save time and money. (I saw one pump that the seal was leaking nickel solution so bad it ate away the frame of the pump).

RECAP: The horizontal plate filter is good for start and stop operation, clarity is usually excellent. Cleaning can be a sloppy mess with cake and plating solution sliding off the paper media as you try to move the paper to a trash container. Some filters are better, where you can empty the filter and blow air through the cake to push some of the plating solution out. Disposal of paper and cake is much cleaner

and easier. Check gaskets and seals during cleanings, always have a couple of spares on hand.

The vertical leaf filters, after stopping, you can redeposit filter aid on the leaves by starting in the precoat mode. Clarity is excellent. Cleaning of this style filter is manual, air wash wet cake discharge, or dry cake discharge. Again check all gaskets and seals while cleaning.

Problems with filers can be caused by the pumping system. If the pumps have mechanical seals keep rebuild parts on hand. Every 2-3 years rebuild the entire pump. If you continue to get air in the filter, check the glued connections with soapy water.

You need filters for your products so you are going to have to maintain them. Any problems take care of the right away.

THE END . . . .

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