

Carbon purification is a process in which the liquid to be purified is exposed to activated carbon for the purpose of removing organics such as oil or lubricants. This is accomplished by adsorption. Platers have for years employed powdered carbon, either pre-coated directly onto the surface of the filter, or added to the solution in a separate treatment tank when batch purification is employed.

Powdered carbon is, just as the name implies, an extremely fine powder and as such will, if not properly and completely removed, be as harmful a contaminant as the organic material it was intended to remove. Filtration in the 1 to 5 micron range is required to adequately remove powdered carbon.

The use of powdered carbon in the filter reduces dirt holding capacity and restricts flow so much that it retards the ability of the filter to remove solids from the plating tank.

Granular carbon is sized and graded in relatively large pieces with gradings such as 8 x 30 or 12 x 30. This means the entire volume will pass through an 8 mesh screen or 12 mesh screen, respectively, but will not pass through a 30 mesh screen. This makes granular carbon relatively easy to keep from migrating throughout the liquid. It is typically restrained with a 250 micron trap filter.

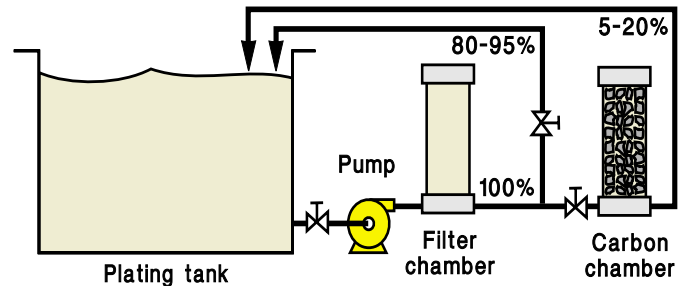
Granular carbon has greater adsorbency than powdered carbon, however reaction time with granular carbon is much slower. The organic material is adsorbed in the interior latticework of the carbon granule. This makes it critical to prefilter the liquid to prevent particles from blinding off the entrance pores of the carbon granule.

The preferred method of combining filtration and carbon treatment to insure a low particle level and a low organic contaminant level is to filter the solution at as high a flow rate as practical for optimum clarity and to treat with carbon at a much slower rate for maximum exposure. Flow rate through the carbon bed is determined by the surface area exposed to the direction of flow. Flows through a carbon bed are typically in the 5% to 20% range when compared to the flow requirements for filtration. Minimum bed depths are 20 inches.

The ideal combined filtration - carbon treatment system will have a pump and filter system sized to provide 2 to 10 turnovers per hour of the solution. On the discharge of the filter, a valved split in the flow will allow 80% to 95% of the flow to return directly to the process tank. The other 5% to 20% will be gently introduced on top of a granular carbon bed and allowed to slowly traverse down through the bed, out the bottom and back into the plating tank.

We have found a good "rule of thumb" for carbon sizing to be one pound of carbon for each 100 gallons to be treated. Under normal operating conditions, this allows several weeks of treatment before the carbon must be replaced.

Any plater who has ever changed a filter with powdered carbon will agree that the use of granular carbon is the preferred method of purification. SERFILCO carbon purification chambers are available for use with all makes and types of filtration systems and can easily be connected to your existing filter, per the illustration below.



## ACTIVATED CARBON PURIFICATION

Virtually all plating solutions will require purification through the adsorption of impurities by activated carbon. Solutions containing wetting agents and brighteners require the most use of carbon since, when oil is transferred into the bath, it is dispersed throughout the solution and clings to the parts, causing peeling or spotty work. Solutions not containing wetting agents have a tendency to float oil to one corner, depending on the recirculation pattern set up by the pump. Brightener breakdown products formed during plating also cause defects. Continuous carbon purification can control these contaminants.

The choice of purification method depends on tank size, amount of carbon required, and other filtration equipment which may be available. Generally, carbon cartridges are used on tanks up to a few hundred gallons; bulk or canister type granular carbon is used for tanks of several thousand gallons. Granular carbon is also used as a separate purification system on the larger tanks to supplement surface filters, depth cartridges or certain automatic filters. Quality of carbon is important. If needed, a sulfur-free grade of granular carbon is available.

Any filter surface or depth cartridge will operate longer without cleaning or replacement if powdered carbon is not applied directly to it. Carbon used in an auxiliary method such as a granular carbon bulk cartridge or granular carbon canister is the recommended approach. A carbon chamber piped in series following a filter used for solids removal and as a prefilter to the carbon is the most effective and desirable method of operation. In this way, the carbon chamber handles a portion of the total flow on a shunt. Thus, continuous filtration can be combined with a selective, separate and more efficient method of carbon treatment.

## CARBON PURIFICATION vs. SOLIDS REMOVAL (cont'd)

depending upon its style of construction and whether it is granular or powdered carbon. The cartridges are also available in 20" and 30" lengths and fit most chambers using replaceable cartridge filter media. Those using granular carbon have an outer prefilter and an inner trap or polishing filter which sandwich the activated carbon granules. Cartridges which incorporate powdered carbon provide an inert matrix binder which prevents release of the carbon fines, yet maintains porosity and maximizes carbon exposure to the passing fluid. They replace a conventional depth wound cartridge quickly and easily and are ideal for in-tank or submersible filtration systems where precoating with filter aid and powdered carbon would be impractical. Carbon cartridges are the most convenient method of bath purification.

### 'MAXI-CARB' CARTRIDGE

Larger powdered carbon disposable cartridges are available in two sizes: 5" diameter by 28" long which contains 3 lbs. of activated powdered carbon, and 5" diameter by 48" long containing 5 lbs. They are interchangeable with similarly sized refillable bulk granular carbon canisters. The large cartridges provide higher flow rates, quicker adsorptive capabilities and cleaner handling than the smaller cartridges, along with 1 - 2 micron particle retention.

### CARBON CANISTER

Ready-to-use plastic 5" dia. x 28" long and 5" dia. x 48" long refillable containers hold 7 lbs. and 14 lbs. respectively of granular activated carbon and are placed in-line in carbon chambers downstream of the plating tank and filter chamber. A built-in 3 micron trap filter prevents migration of carbon particles. Prefiltering ahead of the purification chamber prevents solids from coating the carbon surface, assuring maximum adsorbency. With a bypass valve on the filtration system, any amount of the filtrate can be treated as needed. This method of separate purification has the most flexibility.

Carbon in the canister can be replaced when its adsorptive capacity is reached. Smaller refillable Mini-Canisters (2¾" dia. x 4", 6", 10", 20" or 30" lengths) are also available. They can be installed in a chamber or provided with a hose adapter for attachment to the filter's discharge hose.

### BULK CARBON

Granular carbon is used loose in a canister, chamber or in a bag within a purification chamber. This method maximizes the amount of carbon exposed to the solution and offers the longest operating life before replacement is necessary.

### CARBON PRECOAT

Powdered carbon is co-deposited with the filter aid on the precoat surface of the support membrane, which may be cloth, paper or a depth type filter cartridge (which becomes a surface medium when precoated. For conversion to an easily cleanable surface filter media, the filter cartridge can be replaced with a sleeve assembly.) Use a slurry tank or pail to first recirculate the liquid through the filter, then add filter aid until the solution is clear. Finally, add a mixture of equal amounts of filter aid and powdered carbon. This purification method can be used continuously or intermittently. It is considered by many to be the quickest way to affect adsorption due to the large surface area provided by powdered carbon.

A depth or surface type filter cartridge may be precoated immediately prior to the addition of carbon. The same method is used for batch treatment. Granular carbon can be used, but the rate of adsorption is not as rapid as for powdered carbon although, pound for pound, the adsorbency is comparable.

### BATCH PURIFICATION

Complete batch purification in a separate treatment tank is only necessary if day-to-day in-tank carbon purification proves inadequate. Just as in the case of batch treating for solids removal, the warm solution is pumped into an auxiliary tank. Powdered carbon is added in the required amount and agitated for an hour. Average powdered carbon dosage is 10 lbs. to treat 1,000 gal. of warm plating solution. Sprinkle an adequate amount of filter aid over the top of the solution. As it settles, carbon will cling to it and after settling, the solution may be decanted by inserting a suction hose near the top of the solution, gradually lowering it as the solution is pumped through a filter precoated with filter aid. Periodic checks of the discharge filtrate should be made to ensure that no carbon gets back to the plating tank. A very important consideration when batch carbon treating is to determine that the method of transfer filtering back to the plating tank provides adequate solids holding capacity.

*This portable filtration system includes a slurry tank for precoating, and a filter chamber for removing solid particles and to protect the separate, in-line carbon chamber.*

