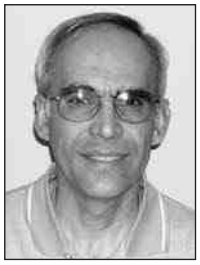

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Filtration: Keeps Things Out — Gets Things Out

As a means of treatment, the procedure of filtration encompasses many consumer and commercial applications. The food and beverage industry would be hard pressed without the ability to blend and mix ingredients, resulting in tasteful, nutritious products. In our homes we may fill canisters with filtered water, insert coffee into the filter paper and await some fresh brewed java. Before baking a cake or dessert, the mixture may have been passed through a cheese cloth. Various industries also employ filtration in many specific disciplines, as does the medical field. Because of its ability to enhance mixing and first rate purification effectiveness, much of what is now done on a daily basis would not be possible. This especially includes metal finishing.

Plating solutions would the most common process baths being filtered. Contaminants are introduced into these baths in several ways. On a gradual basis, typically minute quantities of contaminated rinse waters are dragged in. While plating, some organic additives may be oxidized, sludge can buildup as a result of side chemical reactions which occur. Left unchecked, these and other contamination sources can accumulate to the point that preferred metal deposition is detrimentally affected. In addition, specifications may not be met, corrosion resistance of the finish may be altered and rejects become an expensive reality. To offset these and other problems, finishers have successfully used carbon as a filtering medium, removing many of the organic, water soluble or emulsified contaminants. An effective filtration system incorporates the following progression:

Pump plating solution from tank through a filter chamber →
Continue through a carbon chamber →
Return to the plating tank.

This has proven to be most effective, especially since carbon is an excellent medium for removal of the specific contaminants. Over the years, hard-to-handle powdered carbon has been supplanted by granular material, in most filtration applications. The filtration system may employ carbon-filled cartridges for baths up to a few hundred gallons. Larger precoated, enclosed disk units are more effective on baths approaching 1,000 gallons and above.

An optimum type of granular, activated carbon to use for most plating bath filtration and purification purposes, consists of:

+10 mesh, 5% maximum
-40 mesh, 0.5% maximum

The total surface area of the material is to be in a range of 1,000 to 1,100 square meter / gram.

Precoat media can also be used when coating plates or disks with carbon. Diatomaceous earth is recommended for such common plating solutions as nickel, acid copper, acid tin and acid zinc. Alpha cellulose is recommended for the alkaline and cyanide plating baths.

It has been found that high solution flow rates, using coarse or granular carbon, actually maximize the soil holding capacity. This is because a small amount of fine particles is retained in the media. Upon each subsequent pass of solution, more of the fine particles are held, forming a precoat that actually seals the coarse surface, increasing the capacity to remove and hold fine particles.

Carbon cartridges are a convenient and clean system to maintain adequate solution purification. The cartridges are commercially available in lengths from 10 to 30 inches, fitting most filter chambers. Carbon is prepacked with a binder, and the cylinder sealed. Maintenance consists of simply replacing the used cartridge with a fresh one. There is no mess or personal handling of carbon.

Ready-to-use canisters are filled and sealed with from 5 to over 10 lb. of granular carbon. The canister is placed in the filtration line preceded by a filter chamber, which removes fine particles. The soiled or loaded canister is replaced with a fresh one.

Precoating the larger disk units consists of co-depositing the previously described filter aid material with powdered carbon on to a membrane. The typical procedure is to coat the membrane from a slurry of diatomaceous earth followed by a coat of carbon, then complete with another coat of diatomaceous earth. The diatomaceous earth helps by sealing in the powdered carbon. The loading is one part of carbon to two parts diatomaceous earth. Equipment manufacturers will specify the appropriate weights of carbon and diatomaceous earth for their particular units.

Batch purification is a more aggressive treatment for the plating bath. The procedure must be conducted by transferring the plating solution to a treatment tank. Depending on the type of bath or degree of contamination, oxidizing agents such as hydrogen peroxide or potassium permanganate may be used in conjunction with the carbon. The amount of carbon used in this treatment may be in the range of 13 to 40 oz/100 gal.

Employing the proper filtration improves efficiency of the process. This is very critical in that many plating installations minimize drag out losses, recycling plating solution back to the process tank. Purification filtration becomes more critical to remove organic and particle contaminants. This is why equipment improvements allow for excellent service life of filtering units and their inherent parts. Carbon and related media are supplied in convenient packag-

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COATING 2008 online registration opens

On-line registration for COATING 2008, the international conference and trade show for the end users of industrial coatings, is now available on the show website: www.thecoatingshow.com. Focusing on today's "hot topics," COATING 2008 will brings the latest on green technologies, energy efficiency, cost reduction and quality improvement in both its conference sessions and through its more than 150 exhibitors on the show floor. The three-day conference will feature more than 30 sessions covering everything from liquid to powder coating, electrocoating to IR curing and pretreatment to porcelain enamel.

Scheduled for September 23-25, 2008 at the Indiana Convention Center in Indianapolis, IN, COATING 2008 is sponsored by the industry's leading trade associations: The Powder Coating Institute, The Chemical Coaters Association International, The Electrocoat Association, The Porcelain Enamel Institute and the Industrial Heating Equipment Association's Infrared Div. This is the finishing industry's comprehensive conference and trade show that brings finishers a timely and important technical conference program along with a show floor filled with the latest technologies to help to turn operations green and become more energy efficient while cutting costs and raising quality. ***P&SF***

Answers to I.Q. Quiz #443

From page 7

1. Airborne dirt, air agitation, anode dissolution, bus bar deterioration (via chemical attack, corrosion), chemical additions, drag-in, undissolved additions (boric acid) and water replenishment.
2. 1.0 to 100 µm
3. False. Cellulose powders are more appropriate
4. Increase the chances that a particle will be picked up.
5. Microfiltration, reverse osmosis, ultrafiltration and nanofiltration.

Fact or Fiction?

Continued from page 25

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Editor's Note: *Don't forget to check out Mr. Dini's blog at http://myblogscience.blogspot.com for more of his provocative works that might not have appeared in* Plating & Surface Finishing.

Finishers' Think Tank

Continued from page 26

ing for ease of installation, maintenance and replacement. Because of the dependable utility of equipment, one or two bath turnovers can be improved to two to four. More solution filtration over time improves clarity, plating quality and overall process performance. A superior filtration system with carbon would use a system rated to turnover the solution from two to ten times per hour. At the discharge point, 80 to 95% of the filtered solution returns to the plating tank, while 5 to 20% flows to a granular carbon bed, passes through, and back to the plating tank.

It is critical to note sources of contaminants in the plating bath that are preventable. For example, oils and grease dragged in would indicate poor cleaning and/or insufficient rinsing. Ripped anode bags are a continual source of plating deposit roughness. In the example of nickel plating, the process is 93% efficient, while closed looping may be up to 100% efficient. This unfortunate circumstance builds contaminants and also promotes a common ion effect, where precipitated salts coat the anodes, resulting in polarization. Parts dropped in the plating tank, depending on solution pH, may gradually dissolve, resulting in metallic contamination. These are problems that filtration is not a cure all for. There is no magic wand. But by practicing good maintenance, optimizing processes and staying the course, proper filtration adds that extra octane, supplying high performance to metal finishing processes.

I wish to thank Mr. Jack Berg and Mr. Charles Schultz of Serfilco for their technical expertise. ***P&SF***

Editor's Note: *Be sure and check out Charles Schultz's article on filtration in this issue.*