FOCUS SOLUTION FILTRATION

Aqueous Cleaner Maintenance

Using filtration, agitation and oil removal to keep cleaners clean . . .

By Mike Berg
Product Manager
SERFILCO Ltd.
Northbrook, Illinois

With the move away from solvent cleaners and the growing use of aqueous cleaners, many companies have encountered problems with cleaner chemistries not operating at desired performance levels. Often, much time and money are spent determining the chemistry, temperature, cycle time, pH and additives for the cleaner bath, all to ensure proper parts cleaning. These are important considerations, yet without proper filtration, agitation and oil removal, attention to these details will not adequately maintain cleaner solutions.

A fresh cleaner bath operating at the proper temperature, with all other conditions perfect, will do an excellent job on the first batch of work. However, as more parts are cleaned, they deposit particulates and organic matter that render the cleaning solution less effective. As the solution becomes loaded with contaminants, no adjustment in chemistry, temperature, cycle time, pH or additives will adequately maintain cleaner performance. The most efficient and effective way to maintain the cleaner solution is to remove dirt and oils when they are introduced.

The first maintenance method is filtration. There are a variety of filtration technologies available, including bag, disc, cartridge and automatic filtration. Important factors that influence the type of filtration selected typically are cost and floor space available.

For light dirt-loading applications, bag and disc filtration may be adequate. Bag and disc filtration are surface loading and therefore the volume of the filter chamber is relatively large, so equipment will take up more floor space than a depth-cartridge unit of the same capacity.

Automatic filtration systems, such as indexing fabric filters or permanent-media backwash systems, are also available for cleaner solutions. Automatic systems typically require a higher initial expenditure and more floor space, yet payback is achieved more quickly because less labor is required to maintain the equipment.

The most efficient and effective way to maintain the cleaner solution is to remove dirt and oils when they are introduced.

Bag, disc and automatic backwash filters may be more economical downstream on plating or final process solutions, since the amount of dirt removed should be less than in a cleaner bath. Spent media from cleaners is typically non-hazardous. Trapping most of the dirt in the non-hazardous area minimizes dirt going downstream to potentially more hazardous solutions where disposal of the spent media could be a major concern.

Often, the most economical and effective means of cleaner filtration is a depth filter cartridge. The depth filter cartridge consists of a rigid one-inch ID core (typically polypropylene) with fiber string continuousl wound around the core. The result a diamond pattern "crisscross" media with larger holes or pores on the outer diameter becoming increasingly smaller toward the inner diameter or core. The amount of fiber wrapped on the core and the tension of the winding determine the cartridge's micron rating.

Lower micron cartridges are wound tighter, use more fiber, have smaller pore sizes and usually cost more than coarse cartridge media. In addition, finer micron cartridges do not hold as much dirt, fill with particulate more quickly and require more frequent changing. Higher micron or coarse cartridges use less fiber, are less tightly wound and cost less. A coarse filter cartridge with larger pores will initially pass larger particles. However, as the pore loads with particulates, the particulates serve as media, lowering the pore size and allowing filtration of smaller and smaller particles.

Cleaner baths often contain a range of particle sizes and a large amount of particulates. The advantage to using coarse cartridge media on cleaners is that their greater dirt-holding capacity makes them more appropriate for the range of particulate sizes

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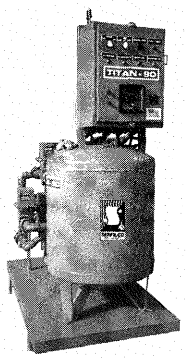
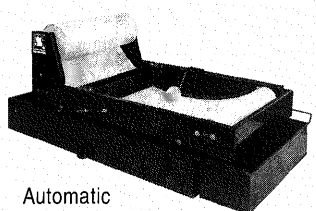
Reduce costs and improve product quality through:

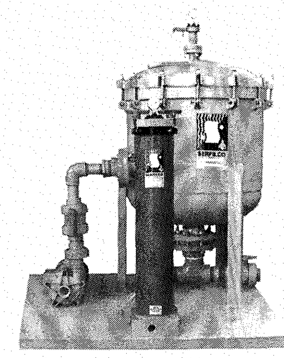
- Clarification, purification and continuous recirculation
- Extension of solution life
- Elimination of rejects
- Efficient, economical liquid / liquid separation



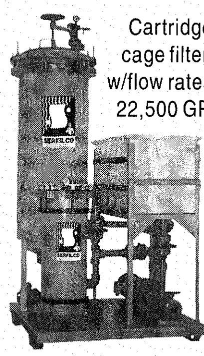
Permanent media filters w/flow rates to 30,000 GPH



Automatic indexing filters w/flow rates to 67,800 GPH

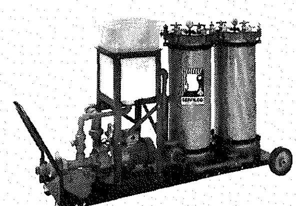


Disc filters w/flow rates to 19,000 GPH

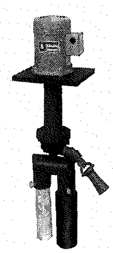


Cartridge cage filters w/flow rates to 22,500 GPH

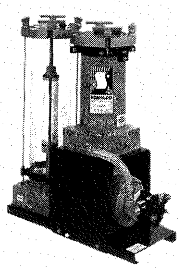
Compact filters w/flow rates to 6,600 GPH



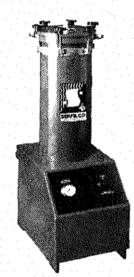
Portable filters w/flow rates to 14,000 GPH



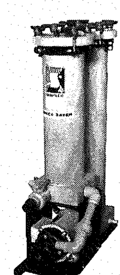
In-tank filters w/flow rates to 6,000 GPH



Coalescing systems for liquid / liquid separation



Metal recovery systems



Carbon purification & ion exchange systems found in dirt-laden cleaner solutions. As larger particulates load the filter's pores, the pores become smaller and trap particulates finer than the filter's micron rating.

To maintain solution at a certain level of clarity, cartridges as low as 15, 20 or 30 micron are often specified. However, a 100 micron cartridge provides three times the dirt-holding capacity of a 15 micron cartridge. At a high solution turnover rate, the cartridge will load with particulates that will serve as media. This way the cartridge will filter at lower than the 100 micron level with minimal reduction in flow. This method provides longer high-flow operation between cartridge changeout and higher levels of dirt removed on a continuous basis. This translates into reduced maintenance costs and fewer, less expensive cartridges used, doubling savings on a vital part of the manufacturing process. Since organic matter/oils typically attach to fiber and particulate matter, the more particulate matter removed, the more residual oil is removed from the solution.

The cartridge-type filtration system is normally less expensive and will require less floor space than other filtration systems of equal and often less capacity. Cartridge-type filtration with coarse media provides the highest possible dirt-holding capacity in the smallest, most economical package when used on cleaner baths. A quality 100 micron, 10-inch cartridge holds up to 16 oz of particulate matter. Therefore, a filtration system with 60 10-inch depth-type filter cartridges of 100 micron porosity will hold up to 60 lbs of particulate matter.

To properly size a cartridge-filtration system, consider flow rate, filter surface area and micron retention. First, solution recirculation rates should be at least five to 10 turnovers per hr. Higher dirt-loading applications will require higher turnover and vice versa for lower dirt loading applications.

To determine surface area, a common rule of thumb is to provide at least three and a half to seven sq ft of surface area capacity per 50 gal of solution. One 10-inch filter cartridge will provide three and a half sq ft of filter area. One 10-inch cartridge per 50 gal for light dirt loading and a minimum of two 10-inch cartridges per 50 gal for higher dirt loading are recommended. As an example, a 400 gal cleaner requires a filtration rate of 2,000 to 4,000 gph and a filter capacity of 28 to 56 sq ft (eight to 16 10-inch cartridges). More surface area means more dirt removed per cartridge changeout and less frequent changing. Coarse filter cartridges up to 100 micron are recommended for maximum dirt-holding capacity.

The second important method for ensuring a cleaner solution's longevity and effectiveness is proper agitation. Filtration systems will, at a minimum, double the life of a cleaner bath. While removing bulk particulates, the filtration system will provide some agitation. More aggressive agitation will assist the cleaning process by mechanically removing solids from parts. To provide a means of aggressive agitation, select a method that will not lower the temperature or introduce dirt or oils into the solution. Air agitation from a compressor or blower increases solution heating costs because the air is at ambient temperature, often lower than the bath's operating temperature. This will cause solution temperature to drop and require added heat to maintain proper temperature. Air agitation can also introduce oil and particulates to the solution from the compressor's lubrication system, and agitation from a blower will introduce airborne contaminants from the surrounding atmosphere. In addition, air bubbling up through the solution will increase emissions from the tank into the surrounding environment. For these reasons, air agitation is not recommended for cleaner tanks; nor is it recommended for many plating tanks.

Liquid agitation nozzles that vigorously circulate a properly filtered cleaner bath are recommended for agitation. Eductor nozzles are strategically attached to sparger piping and cleaner solution is driven through by a dedicated pump. Using the clean, filtered solution for agitation instead of air does not introduce additional oil and dirt. More uniform tank temperatures and reduced heat stratification reduce the amount of energy required by heaters. Increased mechanical agitation also minimizes the necessity to maintain the higher temperature otherwise required for optimizing cleaner performance. Evaporation and emissions associated with air agitation are also eliminated. As eductor nozzles sweep solution across the tank floor, particulates cannot settle on the tank bottom. Particulates held in suspension are more readily removed by the filtration system and deposited in the filter media.

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If, after properly sized filtration and agitation equipment are installed and operating, residual surface oil still causes problems, oil removal equipment should be employed. Often, coalescers or ultrafilters are installed to remove surface oil on an unfiltered bath. Without the adequate bulk particulate removal, ultrafiltration and coalescing systems are plagued by constant plugging problems and greatly reduced flow.

For a relatively small investment, a coalescing system connected to an overflow weir or skimmer assembly on a properly agitated and filtered

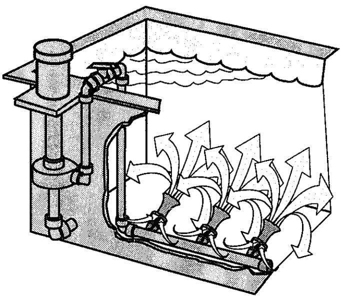
160F cleaner solution will effectively remove non-emulsified surface tramp oils. Coalescing systems can be run during production time or during off hours when the solution is cooler and coalescing efficiency is improved. Contact your chemical supplier for non-emulsifying cleaners to take advantage of coalescing technology. If an emulsifying cleaner must be used, ultrafiltration will effectively remove emulsified oils.

Always check the compatibility of construction materials for the proposed filtration, agitation and oil removal equipment with the cleaner chemistry. Cleaners run at 160 to 200F may require CPVC, yet some new high-alkaline cleaners tend to embrittle CPVC compounds. In these cases, polypropylene is recommended, but only up to 160F. Provide chemical manufacturers' MSD sheets to your equipment manufacturer for evaluation and recommendation. Immersion testing samples may be required if compatibility data is inconclusive. Reputable equipment manufacturers will provide material samples for test purposes.

By using this three-tiered approach (filtration, agitation, oil removal) substantial benefits and cost savings can be expected. First is the improvement in the consistency of final surface coating quality, which is directly related to minimization or elimination of scrap/rework. Next, a reduction of labor costs for tank maintenance can be expected. Continuously filtered solutions will not require decant, sludge scraping, retransfer and reheat of solutions. By extending cleaner life, reduction in expenditures for cleaning chemistry will be realized, and associated hauling costs or waste treatment problems will be greatly minimized. A properly filtered cleaner will also reduce oil/particulate dragin to plating tanks or other downstream process solutions. The savings these benefits provide quickly pay for equipment. Today's technology provides all the necessary equipment to achieve your liquid handling goals. **PF**

Cartridge-type filtration with coarse media provides the highest possible dirt-holding capacity in the smallest, most economical package . . .

SER-DUCTOR® SYSTEMS FOR AIR-FREE AGITATION OF:

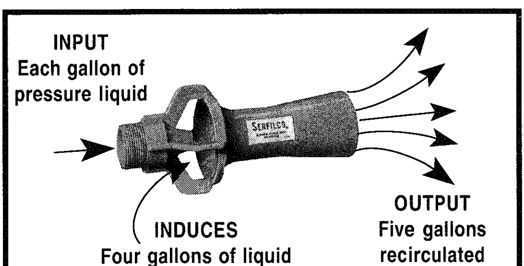


CLEANING / ANODIZING / PLATING WASTE TREATMENT and OTHER PROCESS SOLUTIONS

- **Mixes and agitates**
- **Provides constant agitation because SER-DUCTOR Systems don't clog**
- **Standard systems available in polypropylene or PVDF**

SER-DUCTOR Systems provide solution agitation by drawing liquid (cleaner, rinse, plating etc.) from a tank and returning it to the tank through eductors strategically placed along a sparger pipe. These systems permit the use of relatively small pumps to recirculate large volumes of liquid, avoiding liquid and temperature stratification. Solutions are agitated without the introduction of foreign matter such as airborne dirt or compressor oil.

SER-DUCTOR agitation in the cleaner tank keeps particulate from settling to the bottom where it can form a layer of sludge that shortens the life of the cleaner, requires expensive dumps, new make-ups and costly down-time for manual clean out of the tank bottom. By effectively keeping the "dirt" in suspension, the SER-DUCTOR System makes it easier for the filtration system on the cleaner tank to remove particulate. This extends the life of the cleaner and eliminates the possibility of contaminants being carried to the rinse tank and ultimately to the process tank where it can lead to rejects.



Liquid pumped into the eductor nozzle exits at high velocity, drawing an additional flow of the surrounding solution through the eductor. This additional flow (induced liquid) mixes with the pumped solution and multiplies its volume five-fold.

SERFILCO®, LTD.

U. S. A.
1777 Shermer Road ● Northbrook, IL 60062-5360
Phones: 847-559-1777, 800-323-5431
FAX: 847-559-1995 ● Email: sales@serfilco.com
Web: http://www.serfilco.com

CANADA
Mississauga, Ontario
Phones: 905-820-4700
800-565-5278 (Can. only)
FAX: 905-820-4015

EUROPE
Manchester, England
Phone: 0161-872-1317
FAX: 0161-873-8027