

# FILTER BASICS—

## How to Solve the Most Common Pool Filtration Problems



By Alan E. Sanderfoot

**Summary:** *If happy customers are key to a pool dealer's success, then crystal-clear pool water is the lock. And locking the customer's smile on their face means ensuring a well-plumbed pool with properly sized equipment.*

Swimming pools require meticulous water care—both when balancing and sanitizing the water. When a pool turns cloudy or green, the filtration system is often blamed when the problem actually lies with the water chemistry. No filter can keep up with the growth of live algae, which is why maintaining the proper residual of sanitizer is so important. Regardless of the filter type, however, this is more a chemical problem than a filter problem.

Even so, things can go wrong with pool filtration equipment whether your filter medium of choice is sand, cartridge or diatomaceous earth (DE)—see *Table 1*. So, before you blame the homeowner's inability to manage the pool's water chemistry, make sure there aren't any defects in the filtration system. Here are some of the filter problems most often encountered and what dealers and their customers can do about them.

### **Improper sizing**

Often, a pool contractor will size the filter based on the manufacturer's recommendations. To keep costs down and make their product more competitive, however, it's to a manufacturer's advantage to sell the smallest filter possible for a given application. If one pool builder specifies a 20-square-foot filter and his competitor specifies a 25-square-foot filter, the first builder has a better chance of making the sale because his price will be lower.

Due to this, many manufacturers stretch their sizing charts to the limit. Sure, the filters will work at the flow rates

listed but not well or, in some cases, not long. Fortunately, some manufacturers indicate the best flow rate on their charts, and this is where the contractor should size the filter—not at the maximum flow rate. In fact, a slower flow rate usually yields better filtration.

Just remember, in the case of DE and sand filters, there must be enough flow to backwash the filter. Backwash flow rates aren't naturally higher than during the filter cycle. That's because during backwash there's much less piping and fewer fittings to cause resistance. Sometimes the flow rate during backwash is too high and a valve must be throttled back to maintain the proper flow rate.

### **High system pressures**

When the filter's pressure is 7-10 pounds per square inch (psi) above its starting pressure, it's time to clean, backwash or regenerate, depending on which type of filter you're using. When you see a filter pressure of 20 psi or more when the filter is clean, though, you can bet the total filter system is out of balance. A balanced system is where the pump, filter and piping are all working together, not against each other.

High system pressures indicate high velocity, an enemy of good filtration. With DE and cartridge filters, high velocity can drive dirt particles straight through the filter media. With sand filters, high velocity drives the dirt too deep into the sand and, in some cases, through the sand bed. It can also cause sand to get washed away during the backwashing process. Check the output of the pump to be sure it equals the filter's design flow rate and replace the pump if it's improperly sized.

This situation is most common where salespeople hype horsepower to close the sale, wrongly convincing a customer bigger is better. This not only costs the customer more for equipment, it results in higher energy bills and a filter system that doesn't work as well as it should. An

oversized pump also can shorten equipment life. Conversely, an undersized pump may not provide sufficient flow for backwashing. Check the output of the pump to be sure it equals the filter's design flow rate and

### **Figure 1. Troubleshooting filter cycles**

Among things to consider when the filter cycle seems too short are:

- **Low chlorine residual:** This could allow contaminants and algae to prematurely clog the filter.
- **Excessive flow rate:** If the pump output exceeds the design flow rate of the filter, the pressure could rise quickly
- **Undersized filter:** An overworked filter will need more frequent cleaning than one properly sized for the volume of water being filtered.
- **Improper backwashing:** For sand and DE filters, make sure the water runs clear in the sight glass to ensure proper backwashing. This process usually takes about two minutes.
- **Live algae:** No filter can keep up with live algae in the pool. That's why a proper sanitizer residual should be present at all times. Super-chlorinate the water and run the filter until the problem clears up. When filtering dead algae out of a pool, it may be necessary to apply a floccing agent to the water and clean the filter every few hours until the algae has been removed.

- **Biguanide-based sanitizers:** Sold under such brand names as Baquacil and SoftSwim, these products can cause filters to clog more quickly, requiring more frequent cleaning.

- **'Clogged filter elements: Chemicals** (especially chlorine granules and tablets that use binders) can cause an increase in the water's mineral content, which can eventually lead to deposits forming on the inside of the filter. For sand filters, try removing approximately 1 inch off the top layer and replacing it with the exact amount you removed. The normal life span of sand is at least four years.

replace the pump if it's not sized properly.

**Table 1. Filter comparison**

All types of pool filters do an adequate job cleaning water. DE filters out the smallest particles but restrictions on backwashing DE to waste have more pool owners opting for cartridge filters, which have been increasing in popularity in the past five years. Sand filters, thought the least effective, remain most popular because they cost less than the other types:

Filter type	Estimated market share	debris	Size of filtered
Sand	50 percent		20-40 microns
DE	25 percent		2-5 microns
Cartridge	25 percent		10-15 microns

Before re-sizing the equipment, check to make sure any valve along the return line is fully open. Sometimes, the eyeball fitting on the return line is too small for the volume of water being moved through the system, and simply replacing the fittings with a larger one can reduce pressure.

### Short filter cycles

Though the time between filter cleanings will vary from installation to installation, as well as in different regions of the country, filters should be cleaned or backwashed whenever the pressure is 10 psi greater than the starting pressure. If the filter cycle seems too short, there could be one or more problems (see *Figure 1*).

Special cleaning solutions may be needed to remove deposits from DE and cartridge filters. For DE filters, it's a good idea to remove the mineral deposits at least once a year. You can do this by soaking the DE grids in a large plastic container with about 1/2 cup automatic dishwasher detergent and warm water. Soak the grids for three to four hours and thoroughly rinse them off before reassembling the filter. If you're not using biguanide products to sanitize the pool, you can also use a 1-to-1 solution of 20 percent muriatic acid and water. Or try one of the commercial filter element cleaners, mixing it according to the manufacturer's instructions.

Bear in mind, however, acid washing a cartridge filter when unwarranted drastically impairs filter performance. Unlike DE filters, which absorb oils and organics before they reach the grid cloth, cartridge filters have nothing to absorb these contaminants but the filter element. The polyester fiber used in cartridge filter media actually attracts and holds oils, body fluids and other organic matter. Acid applied to the filter element in the presence of these organics will cause the fiber to become tacky, thereby bonding organics to it like glue and permanently plugging the filter. To determine if acid washing is required, clean the cartridge filter with a degreasing agent and rinse clean. Then, apply a few drops of acid to a small area of the filter element. If no bubbling is seen, the element doesn't require acid washing. If bubbling occurs, there's a buildup of calcium or minerals that needs to be removed. Do this by soaking the element in a solution of one part muriatic acid to 20 parts water until the bubbling stops. Thoroughly rinse the cartridge

before putting it back in the filter. Always wear rubber gloves and safety glasses when using muriatic acid or chlorine, never mix chlorine or liquid bleach with acid, and always add acid to water—never vice versa.

### Low flow

If there's low flow back into the pool, the problem may not be with the filter. If the filter media is clean and flow rate is still low, check for blockage elsewhere in the system. Make sure the pump's hair-and-lint trap is empty and clean and there's no obstruction in the lines on either side of the filter. Also, make sure piping isn't too small for the system. Meanwhile, rule out the possibility of air leaks on the suction side of the pump. Check connections between the pool intake and pump, make sure the water level isn't too low and see that the pump is primed properly. If the flow rate is still low, the pump impeller and diffuser may be worn and in need of replacement. Also, the pump may not be getting enough voltage and could be operating under speed. As a last resort, make sure the pump isn't too small for the system and, if necessary, replace it with a larger pump.

### Cloudy waters

Cloudy water typically relates to a problem with water chemistry. Before tearing down the filter, check the sanitizer level to make sure an adequate residual is being maintained. If the water chemistry is OK, turn your attention to the filtration system.

If the pool has a heavy bather load, there's excessive pollen in the air or there's a lot of plaster dust in the water, the problem may be solved simply by increasing frequency and duration of the filtering cycles. Try running the filter continually until the water clears up, then adjust the filtration cycle to run less often. The filtering system should operate long enough each day to turn the total volume of pool water over at least once—or no more than eight to 10 hours.

If the pressure is high, it may simply be time to clean or backwash the filter. If that doesn't solve the

problem, there may be a hole in a cartridge filter or a tear in the element cloth of a DE filter that's allowing debris (and DE) to re-enter the pool. In this case, you'll need to replace the cartridge or filter element. If DE is entering the pool and there's no tear in the filter grid, check for air leaks, which will allow DE to escape back into the pool.

With sand filters, if the media hasn't been charged properly or there's an inadequate amount, channels may form in the sand, allowing water to pass through unfiltered. Also, if the filter hasn't been backwashed regularly, mud balls may form in the sand bed, limiting filtering action. In these cases, the filter should be backwashed and the sand replaced, if necessary.

Despite all the caveats about proper pump and filter sizing, builders often make mistakes in this area that can lead to poor filtration. If the filter is too small, flow rate is too low or pump size is too large, the filter won't be able to do an effective job. On systems with multiport valves, make sure the filter isn't flowing in reverse; the filter should be hooked up to the port marked "pump." Finally, cleaning the filter too frequently can cause cloudy water. Clean only when the pressure rises 7-10 psi over the starting pressure, or when the return flow back to the pool becomes too low.

### Sandy bottom

If a sand filter is sending sand back into the pool, the most common cause is a cracked lateral in the under-drain system. To fix this, remove the sand from the filter and replace any cracked or damaged parts. Another cause may be the wrong type of sand is being used. The proper grade of sand for pool filters is #20 silica sand, which is 0.45-0.55 mm in size. Smaller sand may wash through the system.

### In-floor cleaning systems

It may seem contradictory that something designed to simplify pool maintenance could actually cause damage to the filtration systems, yet in-floor cleaning systems have been known to create filter problems. Water meets a lot of resistance on its way to the in-floor cleaner heads including the filter, heater and lots of plumbing. To overcome this, many builders install a larger pump than recommended for the filter. The result is an overworked filter doomed for a shortened life.

When installed properly, an in-floor cleaning system does a great job of keeping the pool clean. To ensure smoother operation, it's best to plumb the cleaning system separate from the rest of the system. That way, the filter isn't stressed and can do a better job filtering the pool. There are some energy savings this way because the in-floor cleaning

system won't have to run the same number of hours as the filter system.

### **Conclusion**

With proper installation and routine maintenance, most pool filters offer many years of trouble-free service. When

something goes wrong, however, the tips outlined above should clear things up and put a smile back on your customer's face.

### **About the author**

◆ *Alan E. Sanderfoot* is a contributing writer for *Aqua*

*magazine, which ran a longer version of this article in its October 2002 issue. It was compiled with help from the following filter manufacturers—Hayward Pool Products, Jacuzzi Bros., Pentair Pool Products, Sta-Rite Industries and Water Pik Technologies.*