



Aquatic Consulting Services

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Pool Tip #57: Circulation Pattern Dye Testing

Pool operators typically use sodium fluorescein (AKA: Solvent Yellow 73, Acid Yellow 73, Fluorescein Disodium Salt, Uranine, Fluorescein Water Soluble) to test water circulation patterns, look for circulation "dead spots" and leaks in pools, and evaluate inlet operation.

To use sodium fluorescein, first read the MSDS sheet for the sodium fluorescein provided by the chemical distributor. Clear the pool of bathers, and allow the water to settle for a few minutes. Make sure the water is at the proper level.

Put on protective goggles and disposable latex gloves to prevent skin contact with the dye. Empty the container of dye into the surge chamber, or skimmer basket or gutter drain nearest the pump. Use approximately 3 ounces (a small Dixie Cup full) per 100,000 gallons of pool water.

If your pool has water-to-waste rather than recirculating gutters, turn off the circulation pump and isolate the hair & lint strainer. Remove the strainer lid, empty the contents of the container into the basket and replace the lid. Then open the valves to permit normal water flow through the hair & lint strainer, and turn the circulation system back on.

Start the video camera and record the test for future reference, or prepare a chart showing the pool and location of all inlets. Number your inlets on the diagram. Wait one to three minutes. Water dyed a bright, fluorescent yellow-green color will then be seen entering the pool through one of the return inlets. While dyed, the pool will glow in the dark when exposed to black light. Record which inlet through which the color was first observed entering the pool. Record the order of color introduction. Document the inlet pattern, any inlets that don't work, inlets where the water stream was weak, inlets pointed in the wrong direction, or inlets in need of adjustment. Observe the circulation pattern. Look for circulation "dead spots" where the water does not change color, and record.

After 10 minutes, or when the dye reaches all areas of the pool, stop the test. Depending on the condition of your pool circulation and filtration system, whether the pool is located indoors or outdoors, and the length of turnover time, the water soluble dye should disappear completely in a time frame ranging from less than 15 minutes to a maximum of 4 hours. It won't hurt bathers to swim in the pool while the dye is still present, but explain to them why the pool water is discolored.

If you spill any powdered dye on the deck, just dilute it and wash it down the deck drains. If you get full strength powdered dye on yourself, scrub with soap and water (--it may take a day or so to remove all traces of color). Do not breathe or swallow the dye. If you spill dye on your clothes, just wash normally in the washing machine with detergent and water.

Crystal violet is also commonly used as a dye for evaluating pool circulation patterns. The test is conducted in a similar manner with a few notable exceptions. Since the purple color produced by crystal violet will not appear in the presence of chlorine, all traces of chlorine must be removed from the pool prior to starting the test. Add sodium thiosulfate to the pool at a concentration of 1 ounce per 1 ppm per 10,000 gallons of pool water. For example, to remove 2.5 ppm of chlorine from a 360,000 gallon pool, 5.6 pounds of sodium thiosulfate would be needed.

Ex. $(1 \text{ oz}) (2.5 \text{ ppm}) (36) = 90 \text{ ounces} \div 16 = 5.6 \text{ pounds}$

After the chlorine has been removed from the pool, pre mix crystal violet with water (25 grams per 2 gallons of water) and pour the solution into a skimmer or gutter drain. Use 25 grams, about one ounce, of crystal violet for each 67,500 gallons of pool water which will be dyed. To remove the dye once the test is completed, turn on the chlorinator and inject chlorine into the return lines.

Sodium fluorescein or crystal violet can usually be purchased from your local specialty pool chemical distributor, or can be ordered directly from a chemical manufacturer.